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The Physiotherapy Review

Vol. XII No. 2

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THE AMERICAN PHYSIOTHERAPY ASSOCIATION

MARCH-APRIL, 1932

Chicago, Michigan and Minnesota Number

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Call to Convention

The eleventh annual convention of the American Physiotherapy Association will be held at the Hotel Pfister, Milwaukee, Wis., on June 27, 28, 29, and 30, 1932.

In our field of work, as with others, this past year has been one of trying uncertainty. Some of our associates have faced the loss of positions with the resultant changes, and yet our membership has remained intact and has showed a steady increase.

Let us, who have been more fortunate, show our appreciation of this loyalty to the association by making the 1932 convention a success, and in so doing offer the new officers a well prepared program of work for 1933.

BUSINESS TO COME BEFORE THE CONVENTION

Any suggestions or requests, in regard to this business presented for discussion, should be sent in to the Executive Committee as soon as possible after this notice has been received, or given to your delegate attending the convention

1. Committee and Chapter Reports.
2. Amendments to the Constitution and By-Laws.

I (see page 17). That Article VII, Section 2b of the Amendments to the By-Laws be amended as follows:

a. By changing the numbering of b3 to b5.

b. By inserting a new b3, to read as follows: Section 2, b3—To collect an annual fee of $1.00 from each member who registers with the bureau.

Note—Owing to the increasing expense of running the Bureau of Appointments, it has been suggested that a nominal fee be charged for registration of members.

c. By inserting b4 which shall read as follows: Section 2, b4—To accept for special registration, nonmembers who are trained in special phases of Physical Therapy. These applicants must submit credentials verifying their training and experience. An annual registration fee of $3.00 shall be charged.

Note—It was proposed at the last convention that for the convenience of the medical profession, some nonmembers who have had sufficient training in one or more modalities of physical therapy but who have not had the full physical therapy course, be registered with the Bureau of Appointments as special cases, provided that they give credentials of satisfactory training for whatever subject they consider their specialty. There are openings for just such cases and often a full trained physiotherapist is not wanted.

II (see page 5.) That Article II of the By-Laws be amended to read as follows:

a. Section 2, a—Active members shall have had at least one year's practice in Physical Therapy within two years of graduation from:

1. An approved School of Physical Therapy, by which is meant a school which gives not less than three years training in Physical Therapy, and which is on the approved list of the American Physiotherapy Association.
2. An approved Course in Physical Therapy, by which

is meant a Course in Physical Therapy of not less than nine months and which is on the approved list of the American Physiotherapy Association, following graduation from (a) A School of Nursing on the approved lists of the American Nursing Association. (b) A School of Physical Education on the approved list of the American Physical Education Association.

Note—In order to avoid a misinterpretation of the words "school" and "course" as used in the Constitution and By-Laws, it was proposed that a fuller explanation of these be prepared as an amendment.

b. Section 3, b—The Executive Committee shall in its discretion have power to admit as active members candidates whose training and experience are deemed to be equivalent to the requirements in Article II, Section 2, and shall have sole power to judge whether the training and experience of any candidate are equivalent thereto.

Note—This is to make more explicit the power of the Executive Committee to vote upon special cases whose training varies from the standard requirements.

That a new section of Article II be added to read as follows:

c. Section 3, d—The Executive Committee shall have sole power to determine what schools and courses in Physical Therapy are from time to time to be placed on the approved list of the American Physiotherapy Association, or to be removed from such list when it seems advisable.

Note—This is presented to make more explicit the power of the Executive Committee to accept or to reject schools at its discretion.

N. B. Copies of the Constitution and By-Laws may be obtained from Miss Constance K. Greene, 53 Burpee Road, Swampscott, Mass.

3. Discussion of Non-citizen Membership in the Association.

a. The Executive Committee recommends that non-citizens of the United States not be accepted for membership in this association until they have taken out their first citizenship papers.

4. Further Discussion on the School and Course Curricula.

a. A questionnaire was sent out by the Committee on Education to all Chapters.

5. Report of the Nominating Committee.

Herewith we present to you the report of the Nominating Committee.

It was considered advisable to have the officers for the next two years in the mid-western section of the country, and that we might have the opinions of those who knew them best, we wrote to six chapters asking them to make up a tentative panel for officers from among their members they thought qualified to carry on the work of the Association.

It then remained to obtain the willingness to accept the nominations, if elected, of the members suggested for the various offices. This was accomplished and we are happy to say that each one expressed her appreciation of the honor of being chosen and her promise to give her best efforts to the office if elected.

Following is the panel finally chosen: President, Miss Margaret Campbell, Chicago, Ill.; Vice-President, Miss Sara E. Kollman, St. Paul, Minn.; Vice-President, Miss Martha Hindman, St. Paul, Minn.; Treasurer, Miss Lorraine Frost, Iowa City, Iowa; Member-At-Large, Miss Anna Wetterhus, Cleveland, Ohio; Member-At-Large, Miss Emily J. Griffin, Long Branch, N. J.

Respectfully submitted,
CLARA M. EISENBREY, Chairman,
ELEANOR FISHER,
MATHEA BOXETH,
Nominating Committee.

6. Election of Officers. (Nominations from the floor.)

TENTATIVE PROGRAM

Monday, June 27, 2 P. M. Registration. 4 P. M. Tea. Evening, Address of Welcome. Papers: Public Health Nursing, Spalding School, State's Responsibility to the Crippled Child.

Tuesday, June 28, Morning, Adult Clinic at Curative Work Shop. Return to Hotel. Papers: Follow-up cases at the Curative Work Shop, Industrial Surgery.

Tuesday, June 28, Noon, Officers' Luncheon. Afternoon, Business Session. Evening, Papers: Scoliosis, Congenital Deformities, Nerve Lesions.

Wednesday, June 29, Morning, Trip to Madison for the day; train leaves 10:10; Fare, $3.91, Luncheon, $1.00, Dinner, $1.25. Papers: Greetings, Orthopedic Hospital, Poliomyelitis Clinic. Evening, Free.

Thursday, June 30, Morning, Business Session, Election of Officers. Afternoon, Symposium. Evening, Banquet.

Friday, July 1, Post-Convention Trip to Chicago.

EXHIBITS

All contributions for exhibits should be sent to Miss Elizabeth Jones, care of the Hotel Pfister, not later than June 25. This exhibit includes charts, photographs, books, apparatus, anthropometrical instruments, etc.

HOTEL RESERVATIONS

For room reservations apply direct to the Hotel Pfister, Milwaukee, Wis. Room and bath for 3, $2.50 a day; room and bath for 2, $3.50 a day (cot may be added).

TRANSPORTATION

We have selected the Chicago & North Western Railway as the official route to the Convention, including the trip to Madison.

Delegates in the East use any direct line to Chicago, thence Chicago & North Western.

Colorado, California and South Pacific Coast points use line direct to Omaha, and Chicago & North Western.

Oregon, Washington, and North Pacific Coast points use direct lines to St. Paul or Omaha, thence Chicago & North Western.

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(Signed) EDITH MONRO,
Chairman, Executive Committee.

Practical Ultraviolet Therapy

By Dr. Arthur E. Schiller

The teaching of ultraviolet therapy is mostly conducted from the viewpoint of the physician. The physiotherapy technicians receive sketchy information and are supposed to gather the rest as they may. Many never learn the elementary physics of ultraviolet radiation, or the structure of the machine they are to work with and thus, of necessity, cannot give the intelligent type of service that they otherwise could give. In this paper I will try to give only the practical pointers relative to ultraviolet radiation.

Physics. Medically ultraviolet rays are invisible rays whose frequency are greater than those of the visible spectrum. They vary in length from 3900 to 1850 angstrom units and have a definite medical effect. The solar spectrum in its visible portions is divided as follows:

Color	Wave Length	Average Freq. Million millions per sec
Red	7700-6200	375
Orange	6200-5900	541
Yellow	5900-5500	571
Green	5500-4900	595
Blue and indigo	4900-4300	645
Violet	4300-3900	750

Below this group come the invisible rays and the accompanying chart taken from Ultraviolet Radiation by Russell will give a concise picture of the rays in this group:

Medical ultraviolet rays are more or less arbitrarily divided into two groups, near ultraviolet, 3900 to 2600 angstrom units, and far ultraviolet, 2600 to 1850 angstrom units.

The far ultraviolet rays are capable of penetrating the skin but have no bacteriological effect, and are known as biotic rays. The near ultraviolet rays have a strong bactericidal effect, but their maximum penetration is only 1-10 of a mm. These are known as abiotic rays.

The question is often asked, What percentage of ultraviolet rays are given off by various types of apparatus? Pacini's chart answers this question as well as any:

Source	Infra Red	Light	Ultra-Violet
1. Mercury Vapour	52%	20%	28%
2. Sunlight	80%	13%	7%
3. Arc lamps (such as Carbon)	85%	10%	5%
4. Incandescent Lamps	93%	6%	1%

Recent work, however, seems to raise the question as to whether there may not be more beneficial effects from combined rays, but inasmuch as I am trying to keep this paper practical I will have to leave theoretical discussion out of it.

Types of Lamps. Practically all ultraviolet is today produced by some form of electrical arc, electrical spark, or glow discharge.

Carbon Arc Lamps. There are, here and abroad, a large variety of Carbon Arc Lamps. These have been put on the market under various trade names. In general there are two main varieties—the open and the enclosed arcs. The open arcs are types like the "Finsen" lamp, "Belot" lamp, "Radiosol" lamp, etc., operating at 20 to 50 volts current and from 15 to 75 amperes. There are numerous arc lamps sold in every drug and department store, which are also of the open arc variety. It is my opinion that this latter type of lamp is of little value and should not be recommended for use. The best type of open arc lamp is that which operates at the higher voltages and amperages and is automatically controlled throughout.

The "Quain" and "Heliol" are examples of the enclosed arc lamps, the arc being enclosed in quartz, or other penetrable material. Other types of arc lamps used for special purposes, principally in Europe, are the tungston arc lamps and the Iron arc lamps. These are made in both air and water cooled types and are of considerable value in their particular fields.

Quartz Mercury Vapour Lamps. The first Mercury Vapour lamp was made by Arons in 1892, but it was purely a laboratory product. In 1901, however, Peter Cooper Hewitt made the first commercial Mercury Vapous Lamp and, in 1904, Kuch and Heraeus melted natural quartz and made available a quartz mercury lamp.

The essential parts of the Mercury Vapour Lamp consist of a burner, a tube of clear quartz containing mercury, the electrical connections for the same, a method of suspension, a reflector and shield, and a rheostat for controlling the amount of current sent through the burner. The lamps are cooled either by metal fins, or by a mechanical cooling system. They are started either by tilting or by an auxiliary heating system. The commercial types of burners used are the L-shaped type of the General Electric Company, and the elongated U-shaped type of Hanovia Company. Both operate in practically the same manner. Care should be taken to clean the burner with carbon tetrachloride, or a similar product, for the use of alcohol will cause more rapid clouding of the burner and reduce the efficiency of the lamp.

In use the lamp cord is plugged into the connection, care being taken that the polarity is correct. The burner is tilted, or the lamp is otherwise started and allowed to burn until the volt meter reads 75 volts. This is the correct operating range of the lamp and no treatment should be started until this time, because it would be impossible otherwise to duplicate treatments.

TABLE SHOWING THE PROPERTIES OF THE DIFFERENT RAYS OF THE ELECTRO-MAGNETIC SPECTRUM

	HERTZIAN WAVES	INFRA-RED RAYS	VISIBLE RAYS	ULTRA-VIOLET RAYS	X-RAYS	GAMMA RAYS
GENERATION	Oscillating discharge of condensors, resonators, etc.	Heat radiations from hot bodies	Radiated from hot bodies and emitted by ionized gases	Emitted from very hot bodies, and also by ionized gases	Emitted by sudden stoppage of fast-moving electrons	Emitted when atomic nuclei disintegrate
GENERATION IN MEDICINE	Discharge of condensors with spark gap, etc.	Electric radiator, carbon filament lamp, arc	Carbon filament lamp; arc	Mercury vapour lamp; arc	Spark coil or transformer	Radium with thick filter
DETECTION	Coherer	Bolometer; rise in temperature of receiving body	Photography; produce sensation of light; certain chemical actions; photo-electric effect	Photography; phosphorescent effects; chemical effects; ionization; photo-electric effect	Photography; phosphorescence; chemical action; ionization	No effect with fluorescent screen; phosphorescence; chemical action very vigorous; discharge of gold leaf electroscope
REFLECTION	By sheets of metal	By polished metallic surfaces	By ordinary mirror, etc.	Especially by silicon, nickel and magnalium	No ordinary reflection	?
REFRACTION	By large prisms of pitch	By rock salt prisms	By glass prisms, etc.	By quartz or fluorite prisms	No ordinary reflection	?
DIFFRACTION	Yes	With coarsely ruled grating	With ruled grating on glass or metal	With finely ruled grating	Yes, by crystals	?
PENETRATION	Penetrating	Slight penetration rapidly absorbed by water	Slight penetration of body; more than infra-red; red rays most	Very slight penetration of most substances except air, quartz, fluorite and water	Penetrates all matter to a greater or less extent	More penetrating than even X-rays
SELECTIVE ABSORPTION	Metals containing free electrons	Water	Hæmoglobin	Albuminous substances, particularly tyrosin and phenylalanin	Molecules of heavy atomic weight	Molecules of heavy atomic weight
WAVE-LENGTH	Several kilometres to 1,000,000 A	1,000,000 A to 7700 A	7700 A to 3900 A	3900 A to 136 A	1019 A to ·15 A	·1 A to ·015 A
VELOCITY	← 186,326 miles per second →					
MEDICAL APPLICATIONS	High frequency; diathermy	Thermotherapy; calorotherapy	Phototherapy	Actinotherapy	Röentgen therapy	Radium therapy
ACTION ON SKIN, ETC.	With diathermy through heating	Immediate hyperæmia	No hyperæmia if infra-red rays are removed	Hyperæmia after a latent period of a few hours	Hyperæmia after a latent period of many days	Very lasting hyperæmia after latent period
EFFECT WITH OVERDOSAGE	Destruction of tissue	Destruction of tissue with charring	Superficial effect; no destruction of tissue	Superficial effect only	Destruction of tissue	Destruction of tissue
RATE OF ORDINARY REACTION	Immediate	Immediate and soon fading	Immediate and soon fading	After latent period of several hours	After latent period of several weeks	After long latent period, reaction very lasting
ACTION ON BODY	Vaso-dilatation and heating	Hyperæmia; elevation of temperature and decongestive effect	Increases hæmoglobin	General tonic effect, improved nervous tone, and calcium and phosphorus absorption, etc.	Local action; destruction of young active cells	
EFFECT ON BACTERIA	?	Abiotic above certain temperatures	None, unless certain sensitizers are added, such as eosin, erythrosin	Abiotic, also destroying most toxins and antitoxins	None	?

Water-Cooled Mercury Vapour Lamp. In 1906 Kroymayer devised an inverted U-shaped burner of fused quartz for the direct current, and an M-shaped burner for the alternating current. This arc tube is surrounded by a quartz jacket within a water-tight metal case in which is fitted a quartz window. Water cools the burner and the lamp is so constructed that special quartz applicators may be used. The operation of this lamp is similar to the air-cooled lamp, the burner being tilted to strike the arc. In operation be sure that a current of water is circulating through the lamp. This type of burner operates at 50 volts and is usually used either in direct contact or at very close range.

Cold Quartz Lamps. A recent addition to the lamps

on the market is a Cold Quartz Neon-type of lamp. The apparatus consists of a stand, a rheostat, a reflector upon which is placed a quartz grid Neon tube and the electrical connections. Inasmuch as this lamp operates at a very low amperage, the tube stays practically cold. There is also presented a slender Neon tube for orificial work, which is comparable to the Kroymayer lamp. Because of the fact that the tube is cold there is no need for water cooling.

From experimental work already done it would seem that this type of therapy has a definite field in medicine. As far as my personal experiments are concerned, I feel that in many instances it can be used to replace the more cumbersome water-cooled quartz lamps.

The question is often asked, how much ultraviolet ray will be transmitted through the various types of glass.

Luckiesh gives the following table for different glasses 2 mm. in thickness:

Type of Glass	*Absorption Limit*
Common Glass	2950 A
Light Crown	2950 A
Extra Light Flint	2980 A
Medium Crown	3000 A
Light Flint	3050 A
Medium Flint	3150 A
Extra Dense Flint	3350 A
Schott's Heavy Flint	3400 A

Ordinary window glass absorbs rays below 3300 A, so pigmentation does not occur under glass, as rays about 3000 A are most active in producing pigmentation.

Best Crown Glass absorbs very strongly from 3100 A.

Recently F. E. Lamplough, M. A., has succeeded in making a new glass called "Vitaglass." This special glass, which contains a large proportion of quartz, and other ingredients not present in ordinary glass, has the property of transmitting rays up to 2750 A; it is thus freely transparent to all the ultraviolet rays which occur in sunlight. This discovery of a comparatively cheap material which transmits all the natural ultraviolet radiation is of outstanding importance, especially as "Vitaglass" (when bought in quantity) is less expensive than the cheapest varieties of plate glass. When the sun is shining all the beneficial effects of natural sunlight can now be easily enjoyed in warmth and in privacy, in a room having windows or roofs glazed with "Vitaglass."

The Effects of Ultraviolet Radiation. Outside of the production of an erythema and subsequent tanning, and the bactericidal effect of the ultra violet ray, just what effects can be produced by ultraviolet radiation? There is a well-known physical fact that the great majority of body cells absorb ultraviolet rays. The experiments on growing plants and animals, comparing those that have been exposed to ultraviolet rays and those that have been kept in darkness, show the remarkable growth producing result of exposure to radiation. The first *visible* biological effect is the delayed or latent reaction on the skin. Due to the vasodilatation or to an effect on the sympathetic nervous system, there is a fall of arterial blood pressure. Metabolism is quickened, and the immunizing power of the body is raised. Some astonishing results are produced as a result of this. Diarrhea is often checked and deep visceral pain is often allayed. There is an increase in blood hemoglobin in anemia and an improvement in cases of richets.

One of the most remarkable phenomenon following exposure to ultraviolet rays is the increase in blood calcium and inorganic phosphates. Now, inasmuch as calcium salts play an important part in many body processes, this is of distinct value in treatment. Calcium salts have a tonic action and stimulate peripheral circulation. They diminish the permeability of the lymph and blood vessels and stimulate phagocytic action. In addition to this, most of the endocrine glands are affected by the changes in calcium metabolism. Also vaso-motor reflexes are stimulated by the use of ultraviolet. Perhaps these basic facts will explain some of the important effects of ultraviolet radiation.

Contra-indications for Ultraviolet Ray. The following group will give the most important contra-indications.

(1) If the temperature is high.
(2) Grave heart disease where compensation has broken down.
(3) Acute nephritis.
(4) Severe cases of arteriosclerosis.
(5) Cases of very acute eczema.
(6) New growths should never be locally irradiated.

The Treatment should be discontinued if:

(1) The temperature is raised after irradiation for more than 24 hours.
(2) The patient is regularly losing a large amount of weight (except in obesity cases).
(3) The patient is excessively nervous after the first two applications.
(4) The treatment is followed by severe depression.
(5) In psoriasis, an acute eruption develops.
(6) Menstruation is present. (This is customary, but not essential.)

Great care should be taken when the following cases are irradiated:

(1) Cases who have had haemoptysis.
(2) Amyloid degeneration.

Ultra-Violet Measurement. Numerous experiments have been done throughout the last ten years on ultraviolet measurement. It is quite important to be able not only to determine the given dosage at a treatment, but to be able to transmit to another technician that dosage so that it can be re-produced upon another machine. Certain methods that have enjoyed periods of popularity are as follows: Lithopone method, in which lithopone is darkened by exposure to ultraviolet ray. That length of time which it took to produce a 50% darkening of the lithophone paint was arbitrarily called an erythema dose. The method of electrical measurement are extremely accurate, but cumbersome, and numerous actinometers using the galvanometer scale have been devised for ultraviolet measurement. The simplest practical method is to cut a number of equal sized holes in a black sheet of paper, or cloth, and then to expose each opening for an increasing period of time at a set distance, noting the erythema that is produced. From this the erythema dose in its various factors can be judged. This should be repeated at intervals, because as the machine is used the length of time taken to produce an erythema is increased.

Pointers on Technique.

(1) Each patient should be warned of the delayed erythematous reaction and should be told to apply a simple oil, such as olive oil, or cold cream to relieve the discomfort.

(2) Both patient and operator should have the eyes adequately protected. If the eyes of the patient have been exposed and a conjunctivitis develops, ice packs to eyes, and irrigation with a saturated solution of boric acid several times daily, can be used.

(3) Where localized areas are being treated, the surrounding parts may be protected either by material, or by the application of a zinc oxide ointment. In giving

general body radiations to women loin slips can be applied for protection.

(4) Before irradiation the skin should be thoroughly cleansed, and all greasy matter, or powder removed.

(5) When giving a general treatment it is usually wise to cover the back of the patient's head with a towel, otherwise headaches may result.

(6) The general position for radiation is the prone position, although radiation may be given while the patient is sitting up.

(7) Patients differ in sensitivity to ultraviolet radiation. Dark types can stand a longer dosage than fair. Children can stand about one-half the dosage of an adult.

(8) The best distance to use for body radiation is 36 inches.

Types of Erythema Produced.

(1) Very slight degree of reddening, not followed by desquamation of the skin, obtained on an average of one or two minutes at 36 in. from the lamp, increasing one minute daily.

(2) Slightly more reaction, accompanied by mild irritation and followed up fine desquamation. Two and a half to three minutes at 36 in., increasing with toleration.

(3) More severe reaction, accompanied by itching and burning, and later by free peeling of the skin. Five minutes at 18 to 20 in.

(4) Destructive reaction in which there is swelling and blister formation, seven or eight minutes at 18 in. to 1 ft.

Russell has suggested a dosage scale which may be of value:

No. of Application	Duration of Exposure to each side of body	Distance from Source of Radiation	Relative Strength of Dose
1st	2½ mi.	36 in.	1
2nd	3½ mi.	36 in.	1.4
3rd	5 mi.	36 in.	2
4th	6½ mi.	36 in.	2.6
5th	8 mi.	36 in.	3.2
6th	10 mi.	36 in.	4
7th	10 mi.	30 in.	5.76
8th	10 mi.	24 in.	9
9th	10 mi.	18 in.	16
10th	10 mi.	12 in.	36

Remember that it is better to write a prescription for erythema or partial erythema doses rather than minutes of time given, because lamps vary a great deal.

Conclusions.

In a paper of this type it is impossible to cover all of the things that one would like to bring out in reference to practical ultraviolet therapy. However, it is the hope of the author that the facts selected will be of sufficient practical value to the technician to make the article worth reading.

Detroit, Michigan.

The Drinker Respirator

By Charles A. Wordell, Director of St. Luke's Hospital, Chicago, Ill.

Read before Illinois League of Nursing Education, January, 1932

The history of the Drinker Respirator began in the winter of 1927 when the New York Consolidated Gas Company through its Liability Insurance Fund sought to improve the existing method of giving artificial respiration. This task was undertaken because up to this time no satisfactory appliance or method for the prolonged administration of artificial respiration was available.

The Schafer prone pressure method was usually adopted in emergency work, but being aware of its limitation in these cases, they sought to improve the then existing method, and as I have stated, in the winter of 1927 they consulted with Prof. Philip Drinker of the Harvard School of Public Health and requested that an attempt be made to develop and devise a method whereby artificial respiration might be applied for indefinite periods to patients suffering from respiratory distress, caused by poliomyelitis, post-diphtheritic paralysis, drug poisoning, severe carbon monoxide poisoning, etc.

The outcome of the attempt was that Prof. Drinker, with the collaboration of Mr. Louis A. Shaw, also of the Harvard School of Public Health, developed the apparatus which is now known as the Drinker Respirator, and which has, I might add, been approved by the Council of Physical Therapy of the American Medical Association.

The Drinker Respirator is built upon sound principles and in construction is somewhat different from anything that has previously been suggested (1). It consists of a metal chamber mounted on a carriage provided with eight-inch rubber tired, ball-bearing wheels. One end of the chamber opens, and to this end is secured a cot provided with regular bed springs and rubber covered silk floss mattress. The patient's body lies comfortably on this cot and is enclosed within the chamber with the head protruding through a soft rubber collar, the opening of which can be adjusted to fit all sizes of necks.

Several observation windows are conveniently located in the Respirator for watching the patient. There are also three port-lights on each side which may be opened, provided with rubber collars so that a nurse may extend her arms through them to give the patient an alcohol sponge, or any other attention that may be necessary, while the apparatus is in operation.

The Power Plant

On the under carriage, beneath the chamber, is mounted the power plant that induces respiration. This consists of a ⅓ H. P. electric motor operating a suction pump which is piped to the chamber in such a way that it is always trying to draw air from the chamber. This suction, however, is interrupted by a slowly rotating valve which allows the pump to draw air only at regular intervals, simulating the normal respiratory rate. Thus with the pump running, the alternator valve opens up to the chamber, a certain amount of air is drawn out producing a slight negative pressure or vacuum around the patient's body thereby causing his chest to expand as the room air enters through his mouth and nose. This is the inspiratory phase of respiration. When the alternator valve rotates into another position, the atmospheric pressure rushes in through it to the chamber thereby replacing the vacuum which has previously been produced, and causing the patient to exhale. In other words, inspiration is produced by creating a slight vacuum or negative pressure within the chamber and exhalation by replacing this vacuum with normal atmospheric pressure.

Both the depth and rate of respiration are under control at all times and can be varied as to volume and speed. If positive pressure is desired it can be obtained by making two simple connections with flexible tubing. A U-tube water manometer indicates the vacuum applied, which in turn affects the depth of respiration, and a simple arrangement on the alternator carries the respiratory rate from 15 to 30 times per minute.

Rubber Insulation

The whole power plant is rubber insulated so that there is little transmission of noise or vibration to the chamber. The motor blower unit and the alternator valve mechanism are of very substantial construction and are made to run long periods continuously without lubrication. An electric light underneath the chamber illuminates the mechanism thereby facilitating the operation of the apparatus at night; and similarly a light inside the chamber makes it possible to observe the patient at all times. Both the lights and the motor operate from any electric outlet and require no special wiring.

Size

The Drinker Respirator will accommodate anyone from a small child to a man six feet four inches tall and weighing up to 300 pounds. Still it has been designed to go through any standard size doorway and to fit into any hospital elevator. Thus it has a transportable apparatus which can be moved easily on its own wheels anywhere in the hospital and stored out of the

way when not in use, taking up less room than the standard hospital bed.

INFANT MODEL

There is also an infant model designed especially for the resuscitation of the new-born which will accommodate any baby up to about eighteen pounds.

The Drinker Respirator has already been used successfully in many cases of poliomyelitis some of which required continuous artificial respiration for weeks and months, and in one case, for more than six months. There are many cases, of course, in which, even though the intercostals are involved, sufficient respiration may be obtained through the accessory muscles and diaphragm to tide the patient over for a period long enough for the paralyzed muscles to improve. But there are other cases of acute anterior poliomyelitis with intercostal paralysis so severe that it is only a question of time before the accessory neck muscles and diaphragm will become so fatigued as not to be able to supply the necessary respiratory movement to sustain life.

For these cases the Drinker Respirator has proved itself especially valuable. No other method of artificial respiration can approach it for comfort and harmlessness to the patient over practically indefinite periods of time. The negative pressure acts upon each square inch of the chest equally without creating the slightest undue pressure at any point. This principle of operation protects the respiratory mechanism from injury and makes it possible to administer artificial respiration almost indefinitely without discomfort to the patient.

The Schafer method, although signally successful in emergency work, cannot be continued for long periods of time. The constant pressure of the operator's hands exerting a pressure of from 50 to 90 lbs. or more at the rate of 12 to 15 times a minute on the patient's body interferes seriously with his comfort and relaxation and prevents any possibility of sleep.

There is no such discomfort with the Drinker Respirator because it is built for the comfort of the patient. He lies on a comfortable bed. The respirator "breathes" for him. He may eat and sleep while the apparatus is in operation, and can receive the usual nursing care. Moreover, the position of the patient may be easily changed several times a day to prevent the development of hypostatic pneumonia.

There is now considerable evidence that the respirator itself is useful in the after-treatment of children whose intercostal muscles have been affected by poliomyelitis. It is recognized that these children are unusually susceptible to the common respiratory diseases and that they have a tendency to develop round shoulders and flat chests. Promising results are now being obtained in the daily treatment of such children in respirators by means of increasing their chest expansion and exercising their intercostal muscles.

The subsequent course of the child mentioned in the previous case report has been given us by Dr. Arthur T. Legg, of the Children's Hospital, Boston, and Harvard Infantile Paralysis Commission, June 11, 1930, as follows:

"When he was transferred to the orthopedic service E. B. had but one-half inch of chest expansion. He was placed in the respirator periodically to rest the involved muscles and in the hopes that the action of the machine would develop chest expansion. At present he is able to voluntarily expand his chest 2¼ inches. He has not had any sign of a cold.

"Four weeks ago I started another patient in the respirator. His paralysis began in 1927 and he had marked intercostal involvement. He has had many colds since that time and pneumonia on two occasions. He had an expansion of half an inch a month ago, since which time we have had him in the respirator twice a day (for a month). He now has a voluntary expansion of 1½ inches.

"I believe the machine is going to be a wonderful asset in the after-treatment of intercostal muscles following infantile paralysis."

In connection with this statement by Dr. Legg it should be pointed out that the Children's Hospital in Boston now has a respirator especially designed for the after-treatment of intercostal paralysis. It is identical with the standard Drinker Respirator but it is called the orthopedic model because it allows the patient's arms to be out-stretched in their braces. In addition to this the Children's Hospital in Boston also has another special respirator which can be tilted and rotated to change the inclination and angle of the patient. These are still more or less experimental models and although they hold great promise for research work, they will not supplant the standard model because much of this after-treatment work can be carried on with the standard apparatus.

Physiotherapy Service of the Detroit Visiting Nurse Association

By Helen King, Supervisor of Physiotherapy, Detroit Visiting Nurse Association

Fifteen years ago a plan was formed under the direction of Miss Edna Foley, Director of the Visiting Nurse Association, for the after-care of poliomyelitis cases in Chicago. Miss Foley's highly developed program, encouraged by Dr. Robert B. Osgood of Boston, may well be adopted by all Visiting Nurse Associations throughout the country. Brooklyn, New York, has organized a well developed program of after-care for their crippled children.

The value of such work has encouraged a similar plan in Detroit under the guidance and inspiration of Miss Emilie Sargent, Director of the Visiting Nurse Association.

There are one hundred thirty-five nurses on the Detroit Visiting Nurse Staff whose working territory embraces the metropolitan area, which includes Detroit and several townships. In planning a program for the after-care of orthopedic patients, five nurses were selected who were especially interested and equipped to carry on this specialized work. They received their training at Boston Children's Hospital and Harvard Medical School, a special course given to graduate nurses.

In 1928, an orthopedic committee of the Visiting Nurse Board was appointed with Mrs. James S. Booth chairman and Dr. Frederick Kidner as orthopedic advisor. This committee outlined the policy of the department and planned the contacts with the agencies and hospitals. Without Dr. Kidner's interest and understanding we could not have worked out the present organization with such success.

A visiting nurse was assigned to the orthopedic clinic at Children's Hospital of Michigan; this clinic having an enrollment of about sixteen hundred children under twelve years of age. The appointment of the nurse is invaluable to both the hospital and Visiting Nurse Association in that it connects the two organizations in carrying out a program for care of crippled children who can not be hospitalized for the long after-care.

There are four orthopedic surgeons on the staff of the Children's Hospital; Dr. Kidner, Dr. Peabody, Dr. Curtis, and Dr. Funsten, each in charge of certain clinic days. These surgeons give written orders to the orthopedic nurses for the after-care of patients that they refer to them for treatment and re-examine the patients at periodic times.

This specialized group of Visiting Nurses functions as a liaison department of physiotherapy in the metropolitan area of Detroit. Whereas the hospitals and orthopedic surgeons employ physiotherapists, there is a large number of patients unable to afford their services. Then too, because of lack of conveyance or because of home problems, they are unable to attend clinics or private offices for their after-care. When the patients can pay, a small fee is collected by the nurse but most of the work is done with no remuneration. Most of the families are in dire circumstances resulting from their economic distress. Not only does the nurse give specialized services but she reports abnormal social conditions to the proper agencies for relief.

Some of the agencies referring patients to this department are the Public Welfare, City Physician's office, hospitals, Board of Health, private physicians, Herman Kiefer Hospital for Contagious Diseases, and Sigma Gamma Clinic for Crippled Children. University Hospital, the state hospital of Michigan at Ann Arbor, forty miles away, refers patients to this department for after-care also. Dr. Hart and Dr. King, orthopedic surgeons, send reports of the cases and advise as to physiotherapy treatment.

An example of the cooperation of the agencies in this field occurs to me in the case of a twenty year old girl, who came to Tau Beta Clinic in Hamtramck for a general physical examination. The private physician found a condition of advanced scoliosis. She was sent to Sigma Gamma Clinic by the orthopedic nurse working at Tau Beta Clinic and surrounding territory and was examined by Dr. Peabody, in charge of Sigma Gamma Clinic. Whereas this clinic cares for crippled children up to the age of fourteen, a patient is never refused examination by the surgeon for advice as to reference for treatment. He referred this girl to Harper Hospital to Dr. Funsten, who performed a fusion operation.

Four agencies had a hand in the care of this one girl, who could not afford a private physician and would have become so handicapped that she might have become one more dependent on the state.

The Leland School for the education and orthopedic care of crippled children in Detroit plays an important part in the orthopedic field of the city. It is a part of the Board of Education and cares for children unable to attend regular schools. Busses convey them to and from the school. Dr. Purcell, the orthopedic surgeon in charge, holds clinics three times a week and the physiotherapy is given all children during the school regime. When children are able to attend regular schools they are dismissed to them. The Visiting Nurse department use this school in their after-care plan when the children are able to attend. Cases outside of Detroit are not eligible.

Those children and adults who can not be removed from their homes, such as pre-school children, post oper-

ative cases or convalescent polio cases, arthritic and hemiphlegia patients, fractures and other orthopedic conditions, are visited and given treatment by the orthopedic nurses.

In visiting these homes a very important part of the nurse's work is the education of the parents in their cooperation and care and understanding of their child's disability. All nationalities are cared for and some can not speak English but they all learn to have confidence and faith in the Visiting Nurse, who helps them in many ways besides care of the crippled child.

The Public Health nurses, of both the official and private agency, find many orthopedic disabilities while on her rounds and reports them to the orthopedic nurse, who in turn refers them to the private physician. Many times misguided parents are saved from placing their children in the hands of chiropractors and quacks for a guaranteed cure. An important part of the orthopedic nurse's work is to encourage the parents in the cooperation of the after-care of their child, for orthopedic care is always longer than parents can realize and when possible the parents are taught to give the treatments to their children in order to save the nurse too many visits.

The work in Royal Oak Township was started in the fall of 1928 in cooperation with Oakland County Crippled Children's Society. The city of Royal Oak assigned a room in a school for physiotherapy treatments. Three more schools followed in other towns. In these schools an orthopedic class room was established for crippled children unable to carry a regular school regime. Individual attention was thus obtained for the mentally, as well as physically handicapped children and instruction in crafts supplemented by their scholastic program. These children attend the physiotherapy room for their treatments during school hours. Children in the school, less handicapped, report for their treatment during the day while others from nearby schools come for treatment after school hours.

Dr. Curtis, Dr. Funsten, and Dr. Kidner give their services at periodic times in the townships where physiotherapy clinics have been established. The patients are sent in to the hospitals for their operations and returned to their homes later for the follow up work by the orthopedic nurse.

Treatments are given in the physiotherapy clinics two mornings a week. The children are brought to these clinics by volunteers, young women who are interested in crippled children and who have leisure to spend in being of great service to these handicapped children who other wise would find it very difficult and often impossible to secure this treatment. These volunteers can not be too highly commended for their assistance and this service should be an important part of every visiting nurse organization.

The orthopedic committee is an active committee giving much time to the carrying out of this program. Their generosity and interest is often manifested by gifts of infrared or ultra-violet lamps, bakers, photographic supplies for patient's records.

The supervisor of the work of the orthopedic nurses has had much experience and training in orthopedic after-care and to her the nurse looks for constructive criticism and unlimited assistance and understanding. In her work she has been encouraged through the confidence and interest of her committee and the Director of the Visiting Nurse Association. The orthopedic nurses meet one morning a week with the supervisor, cases and treatment are discussed, the patient's disability, environment, mental hygiene, and psychological approach and reactions considered. These nurse's services are not limited to treatment of cases but they are expected to give talks before parents and teachers on orthopedic defects to be found in children and the importance of early recognition of such defects. Slides are used in these talks showing slight defects and advanced disabilities.

An educational film is being prepared recording the gaits before and after operation and treatment, of those cases who have been found by orthopedic nurses.

A well equipped orthopedic library has been developed for the use of the entire staff, lectures are given by orthopedic surgeons, a generous gift of time which is tremendously appreciated by the Visiting Nurse Association. The stimulation received by the close cooperation with the orthopedic surgeons is much appreciated by the orthopedic nurses in their work with their patients.

Sigma Gamma Clinic has generously provided the opportunity to the orthopedic nurses for further experience with orthopedic conditions as a supplement to their course in physiotherapy at Harvard Medical School.

In the past year the total number of patients treated was 598 and number of treatments given in the field and treatment center 10,000.

This physiotherapy service has been functioning just three and one half years. Detroit and metropolitan area has a large population, and there is a field for much expansion of this particular service. But until funds are available the small staff of five orthopedic nurses must continue their work with no increase in their group.

While Michigan has funds available for the treatment and care of orthopedic patients, it is restricted to those under hospital care. The orthopedic committee of the Visiting Nurse Association would like to see the act amended to cover those patients who are under treatment at home.

Basic Principles of the Study of Blood Pressure, Particularly in Relation to the Influence of Physical Measures

By Francis Ashley Faught, M.D., Medical Consultant to the Misericordia Hospital, Philadelphia, Pa.

Read by invitation before the Pennsylvania Physiotherapy Association, December 5, 1931

INTRODUCTION

The study of blood pressure is unique, in that, excepting clinical thermometry, it is the only method of precision employing special apparatus, which enjoys practically universal application. There is hardly a field in medicine, in surgery, or in the specialities, where blood pressure studies and records are not of value.

Our knowledge of the means of determining blood pressure dates back about sixty years, but a widespread interest in it has existed for not over twenty-five years. A general application quickly followed the development of practical, simplified apparatus which made possible quick and reliable readings.

General use and ease of application of this test has, at times, resulted in a tendency to over-estimate the value of the information obtained, to the partial or complete exclusion of equally reliable collateral evidence. One cannot, therefore, too frequently repeat that blood pressure, and its variations, is valuable clinical information —not a disease.

PHYSIOLOGY

The maintenance of blood pressure is dependent upon the intermittent pumping action of the heart which forces the blood throughout the arterial system, from whence it passes through the capillaries and by way of the veins is returned to the heart. The circulation of blood is a vital function, and is continuous throughout life. Cessation of the circulation results in death, although variations in the rate of the pulse, rapidity of flow, and profound alterations in blood pressure may occur without jeopardizing life, but a normal circulation presupposes a normal pulse rate, normal flow and a normal blood pressure; these are essential to the continuance of good health. Hence, a study particularly of the blood pressure and of the pulse rate becomes an important adjunct to the diagnosis and study of many diseases, especially those involving the heart, blood vessels, and kidneys. But this is not all. To give the study of blood pressure its full value, it should include cardiac rate, rhythm and volume output, arterial tonus, and capillary permeability, because disturbances in one or more of these factors may profoundly influence blood pressure and may be the first indication of circulatory weakness.

TERMINOLOGY

Before proceeding to a detailed discussion of this subject, we will define some of the terms employed.

Blood pressure—as at present used, means systolic blood pressure, although it would be more accurate and scientific to qualify the word blood pressure by the appropriate adjective and so to speak of systolic blood pressure, diastolic blood pressure, etc.

Our clinical nomenclature includes the following terms:

1. Systolic blood pressure, or maximal pressure, is used to indicate the level of pressure reached in the large vessels during the systole of the heart.

2. Diastolic blood pressure, or minimal pressure is the level to which the pressure falls in the large arteries during the diastole of the heart.

3. Pulse pressure, range of amplitude, are terms more or less interchangeably applied to the variation of pressure occurring within the large arteries during a heart cycle, and is determined by subtracting the diastolic from the systolic pressure readings.

4. Mean arterial pressure. The use of this term should be confined to indicate in numerical fashion, the average strain to which the large blood vessels are subjected. It is not synonymous with average pressure.

5. Average pressure. Strictly speaking, the term average pressure means the figure that can be obtained only by adding any number of strictly comparable units, i. e. systolics or diastolics, and dividing the sum of the units by the number of units in the series. This is a more reliable indicator of pressure than a single observation.

EXTENT OF APPLICATION: OF THE BLOOD PRESSURE TEST

1. In the first examination of all patients, particularly in the obese, in the aged, and in all those presenting evidences of poor nutrition.

2. In the study of all cases suggesting the presence of valvular heart disease, arterial and kidney disease.

3. As an important part of the routine study of all cases of pregnancy.

4. During the treatment of all cases presenting disturbances involving the heart muscle, and intrinsic cardiac mechanisms, which includes chronic myocarditis, paroxysmal tachycardia, auricular flutter, auricular fibrillation and heart block.

5. In all cases of scarlet fever, in order to detect the earliest sign of kidney involvement.

6. In pneumonia, in order to observe the requirements laid down by Gibson's Rule.

7. During the course of treatment of all cases in which demonstrable circulatory abnormalities are present, for the purpose of, (a) following progress of the condition; (b) to note the success or failure of therapeutic measures.

8. As a part of the preliminary study of all cases presenting for surgical operation.

9. As a prerequisite to the administration of general anesthesia, and spinal anesthesia.

10. During all major and prolonged operations in order to detect the beginning of shock.

11. During the post-operative period in order to detect delayed shock.

12. As a part of the immediate study of all head injuries.

13. As an aid in differentiating between the coma of uremia, and that due to diabetes, and acute alcoholism.

14. To estimate heart load and to demonstrate its variations by means of a simple formula which embodies the systolic pressure, diastolic pressure, pulse pressure and pulse rate. (See Table IV.)

The foregoing will serve to indicate that the study of blood pressure has an extremely wide range of application in medicine, and that with modern, accurate instruments employing the method of auscultation, we are able to estimate with great accuracy the systolic and disastolic blood pressures, and from these figures to compute the pulse pressure. Thus through a study of blood pressure, we are able to detect alterations in these three values, which may often help to clarify an obscure clinical picture, assist in diagnosis, and prognosis, and serve as a guide in the treatment of a variety of conditions, cardiovascular and otherwise.

It should be remembered that not only is positive evidence i. e. abnormal findings, of value, but also negative (normal values); since in the study of serious conditions where extensive surgery is contemplated, or where there is a suspicion of an impending cerebral, cardiac or renal catastrophe, the finding of approximately normal systolic pressure and a normal systolic-diastolic ratio, may be of great diagnostic and prognostic import.

Normal Blood Pressure

It should be remembered that blood pressure, unlike the temperature, has no fixed level. Even in the normal individual, it is subject to wide diurnal variations, which are the result of many closely interrelated factors. This *physiologic* variation covers a wider range than is usually recognized. The term normal blood pressure is, therefore, a relative term, implying variation within certain recognized limits. The diurnal variation rarely exceeds 15 MmHg. above or below the normal average, e. g., a total variation of 30 Mm.Hg. For example, accepting the normal average systolic blood pressure for a young, healthy man of twenty years to be 120 Mm.Hg. it would be unwise to assume, or state that a pressure of 130 Mm.Hg. or even 135 Mm.Hg. occasionally encountered, is abnormal. The same may be said of a reading of 110 Mm.Hg. On the other hand, if the same young man had a systolic blood pressure continuously over 135 Mm.Hg. and at times up to 145 Mm.Hg. one would certainly be justified in considering the finding significant, and a reflection of some abnormal influence of either transitory or permanent nature affecting his circulation.

Methods of Determining Blood Pressure

The auscultatory method is now generally employed, although some still adhere to the older and less accurate method—by palpation. Where great accuracy is desired, as in research work, either the oscillimetric method or the graphic method may be employed. These both require special and expensive apparatus, and it is not necessary for purposes of clinical accuracy to employ them. The graphic apparatus has the added advantage that it records the systolic and diastolic levels in ink, which can be permanently filed for future consultation.

Auscultation Points and Phases

The auscultatory method besides accurately determining the systolic and diastolic pressures, has the added advantage of permitting the study and analysis of the several sounds heard at the bend of the elbow which are produced by variations in pressure in the cuff. John M. Swan was among the first to call attention to the fact that alterations in the pressure within the arm-band produced, with quite definite uniformity in normal individuals, sounds of varying quality and intensity in the brachial artery, and that these sounds were altered, both in character and in length, in various abnormalities of the cardio-vascular system. Swan recognized four characteristic, separate and distinct sounds. In 1911, Goodman and Howell reduced this matter to a clinical basis and recognized four phases separated by five points. (See Table 1.) They showed that good first and fourth phases were indicative of cardiac strength, while poor second and third phases, particularly a sharp reduction in, or complete absence of the third phase, was indicative of cardiac weakness. For the purposes of ordinary clinical study, this careful sound analysis is usually unnecessary, but the method may be of considerable prognostic value in the study of obscure cases.

Reading By Auscultation

The long standing controversy as to whether one should accept the beginning or the end of the fourth phase as the diastolic pressure, remains unsettled. The general tendency now is to accept the end of the fourth phase, i. e. the fifth point, or the moment of disappearance of all sound as the time to read the diastolic pressure. This will be satisfactory except in the study of aortic insufficiency, where the fourth phase is usually prolonged and does not disappear even at zero readings.

Dependability of Blood Pressure Readings

It should not be difficult for anyone with a little instruction, and some practice to accurately employ the auscultatory method of blood pressure reading. Here, however, I would particularly call your attention to one important fact, which is, that original (i. e. the first) blood pressure observations are notoriously misleading, and should rarely be accepted at their face value, except in an emergency, or where the departure from normal is so marked that its significance cannot be misinterpreted. A safe rule to follow is this: repeat the observation several times during the first interview, and strike an average, and better still—repeat the observation a number of times, the intervals between each observation being not less than one day. By this means we may limit the effect of the factors causing transitory variations, and so develop an average, and therefore, more dependable figure for both the systolic and diastolic pressures.

Modifying Influences

The factors influencing blood pressure may be divided, for discussion, under the following headings:

1. Intrinsic and extrinsic cardio-vascular mechanisms;

2. Chemical and chemico-vital and physical variations in the blood composition, such as (A) chemical changes in the composition of the plasma and corpuscles, (B) alterations in composition of the blood itself, as in grave anemias, and in dehydration states, and (C) Alterations

in activity of certain glands of internal secretion, particularly the adrenals, the pituitary, the thyroid and the ovaries.

3. That rather large group of modifying factors which are usually included under the heading of the physiologic factors of variation, the most important of which follow:

PHYSIOLOGIC FACTORS INFLUENCING SYSTOLIC PRESSURE

AGE: There is a gradual but somewhat irregular progressive increase in the normal blood pressure levels from infancy to old age (Table II), modified by the influence of sex;

SEX: During infancy and childhood there is no appreciable difference between the systolic pressure in the two sexes. With the development of puberty a difference in systolic pressure between men and women begins to appear. At age twenty, systolic pressure in males averages 120 MmHg., in women 110 MmHg.

MENSTRUATION: Normal menstruation may be preceded by a slight elevation in systolic pressure, but the most characteristic influence is a reduction of from 10 to 15MmHg at the time of greatest flow.

POSTURE: Systolic blood pressure is temporarily raised by change of posture from the standing to the recumbent. Stevens has shown that the systolic pressure is influenced by change of posture from the standing to the head down, as follows: Maximum increase standing to sitting 11 MmHg; from sitting to recumbent, 19 MmHg; and from recumbent to head down 14 MmHg. These changes are relatively temporary, and are usually rapidly compensated as the individual becomes accustomed to the change in posture.

TEMPERAMENT, EMOTION AND EXCITEMENT: The tendency for sharp diurnal variations to occur has been noted in the nervous as compared with the phlegmatic type. In the emotional type, strong emotion and excitement produces a more marked variation in systolic pressure than in the less excitable individual—a sudden rise of as much as 40 MmHg has been noted.

PAIN: Severe pain may produce a sharp temporary rise in systolic pressure amounting to from 15 to 25 MmHg or more.

MUSCULAR DEVELOPMENT AND POWERFUL PHYSIQUE: Comparison of the systolic pressure in the athlete with the non-athletic has shown an average systolic level from 10 to 15 MmHg higher in the athletic.

EXERCISE AND EXERTION: The degree of exercise and its duration, unless carried to extreme fatigue, determines the degree of systolic elevation. Its effect may be summarized as follows: moderate and prolonged, as in walking, a systolic rise of from 5 to 15 MmHg. Sudden, strenuous, physical effort as in a sprint, or the lifting of a heavy weight, a systolic rise between 25 and 30 MmHg. Sudden, severe effort may produce a rise of 50 MmHg.

PASSIVE MOVEMENTS AND MASSAGE: Rarely cause any significant rise in systolic pressure. There is no evidence to show that massage applied to the abdominal area, unless very firm, materially elevates blood pressure.

DIURNAL VARIATIONS: Irregular, unexplained alternations in systolic pressure occur daily. The pressure is generally lower in the early morning than in the late afternoon; this difference may amount to 15 MmHg. Extreme fatigue may produce a noticeable depression. A period of rest, after activity, has the same effect. *Sleep*, and prolonged rest in bed results in a distinct and often marked fall in systolic pressure. The more sound the sleep, the greater the depression, and the few records available seem to indicate that as the night advances, there is a general rise toward the waking level.

NORMAL SYSTOLIC BLOOD PRESSURE STANDARDS

It has long been accepted that 120 MmHg represents the normal standard systolic blood pressure for a healthy adult of twenty years, but only quite recently have physicians been agreed upon the standard normals for the higher ages. Thus, in 1910 the writer (Ref. New York Medical Journal, July 23, 1910) devised a formula, based upon the then accepted normal systolic levels between ages 20 and 60 years which made it possible to determine with clinical accuracy the normal standard for any age without recourse to a table. In this formula one MmHg. was added to 120 MmHg. for every two years of life beyond 20. Thus at 60 years the standard calculated was 140 MmHg. This was considered conservative when compared with the 145 to 170 MmHg. accepted by some authorities at that time.

In the light of recent, and more reliable evidence, based upon a tabulation of nearly a half million individual records by the large life insurance companies, a gradual but not quite uniform rise from 120 MmHg. at age 20 to 135 MmHg. at age 56 is now generally accepted, and it is unlikely that additional data will appreciably alter this curve.

Recently the author modified his original formula to conform to the new standards, a discussion of which appears in the New York Medical Journal and Record for February 17, 1932, P. 160) which now reads as follows:

Consider the normal average systolic pressure of a male age 20 to be 120 MmHg. For each three additional years add 1 MmHg. to 120 MmHg. The gradual increase in pressure obtained by this formula in various portions of the age-scale compared with the standards of Fisk are shown in Table III.

In determining standards for women, we apply the same formula except that the systolic pressure for women at age 20 is considered to be 110 MmHg. This gives comparable results except during the menapause, i. e. roughly between the ages of 40 and 50, when there is a tendency for the difference in pressure between men and women of the same age to disappear.

PHYSIOLOGIC VS. CLINICAL NORMAL SYSTOLIC PRESSURES

A most important point and one often lost sight of in appraising the significance of systolic blood pressure levels is, that clinically we must not confuse a physiologic normal with a clinical normal. These may occasionally coincide, but are rarely identical. In clinical practise, failure to recognize this fact may greatly cloud the issue in many cases, leading to errors in judgment and sometimes to ill-advised attempts to reduce existing blood pressure levels.

As already stated, the *physiologic normal* is subject to frequent fluctuations which rarely vary beyond the limits of plus or minus 15, when applied to the standard normal systolic level of the age of the patient under observation. The *clinical normal* represents a satisfactory working systolic pressure which, by observation and experience, has been found to sustain an efficient circulatory balance in the face of recognized handicaps. As a guide in clinical practice it is usually advisable to employ this level in estimating the circulatory efficiency of the patient under observation.

THE DIASTOLIC PRESSURE AND ITS VARIATIONS

Blood pressure studies greatly increased in reliability when the auscultatory method was discovered, since this made possible the accurate determination of the diastolic pressure.

Among the many valuable facts discovered regarding the diastolic pressure, is that this pressure is far less subject to the influence of transitory and unimportant modifications than the systolic pressure. It, therefore, becomes a more reliable indicator of the stability of the circulation than the systolic pressure.

The estimation of the diastolic pressure reaches its greatest value when studied in conjunction with the systolic level, i. e. when the pulse pressure is computed, because clinical experience has shown that a normal relation exists between these two pressures, deviations from which are valuable clinical evidence of circulatory changes. It has also been shown that this definite ratio between the systolic and diastolic pressures should exist, irrespective of the systolic level. Thus under optimal conditions, the diastolic level should approximate two-thirds of the systolic level, so that the pulse pressure will be about one-third of the systolic. Disturbances in these relations become increasingly important as the ratio is disturbed in either direction. The application of this simple 1:2:3 equation is a very useful means of determining the "clinical safety" of the case, irrespective of the systolic level.

Attention is called to Table IV where on lines A, B and C are shown readings where this ratio is maintained despite marked difference in systolic levels. Here it will be seen that changes in the diastolic pressure have compensated for the changes in the systolic, so that the normal ratio is but little disturbed; whereas in lines D and E the failure of the diastolic pressure to compensate has disturbed the normal ratio.

The point here emphasized is that a normal ratio may be maintained by changes in the diastolic pressure, irrespective of whether there is a distinct elevation or a definite depression in systolic pressure, which results in the maintenance of circulatory efficiency, a state of equilibrium daily encountered in persons who have no knowledge that they have any cardio-vascular abnormality. Opposed to this there may occur apparently trivial alterations in systolic pressure, which however are not compensated, so that there occurs a profound alteration in pulse pressure, a condition which when met indicates a definite circulatory imbalance which will usually be associated with other definite evidence of circulatory deficiency.

CIRCULATORY EFFICIENCY TEST

There have been numerous attempts by students of the circulation to devise some clinical means of determining heart efficiency by employing various factors and formulas involving the observations of systolic pressure, diastolic pressure, pulse pressure and pulse rate and the effect of exercise on them. Some being based upon false premises, proved unreliable, and have been discarded. Those that have stood the test of time involve a certain amount of more or less accurately measured effort before and after which the blood pressure readings and the pulse rate are recorded, from which some idea of the response of the circulation to strain may be deduced.

Some of these are to be criticized because they employ a variety of exercise which cannot be controlled or accurately measured, thereby introducing an element of error which largely vitiates the test.

Of the best are those which employ some form of ergometer, or effort measurer. The two most reliable employ respectively an ergometer operated by the feet in the form of a bicycle to which graduated friction can be applied, and the other, operated by hand, operates upon the same principle.

In order to avoid the necessity of expensive apparatus, and to permit the application of the test at the bedside, I recommended several years ago the following method which has proven quite satisfactory.

The patient reclines at full length, where after a rest of ten minutes, the blood pressure and pulse are recorded. The patient is then instructed to elevate and lower the legs alternately, from the thigh, without bending the knee, each elevation approximating the vertical. The movements are continued and counted until the pulse has been accelerated 20 or more beats. This usually requires from 26 to 36 individual elevations. Immediately upon cessation of the exercise, the pulse is recorded and the blood pressure again taken. This is done again within 20 seconds, and again at the expiration of 2½ minutes.

By this test, circulatory efficiency will be indicated by a rise in pulse rate accompanied by an increase in both systolic and diastolic pressure, the systolic rising to a greater degree; this results in an increase in pulse pressure. For the reason that this change is sometimes delayed, and also because a fall is sometimes very rapid, the observation is repeated within 20 seconds. At the expiration of 2½ minutes the pulse, together with the systolic and diastolic pressure, should fall, the pulse reaching the original rate or even falling below, while the systolic pressure and the pulse pressure still remain augmented (Table V).

Circulatory deficiency will be shown by various alterations in this normal reaction (Table VI). Thus the rapid pulse may be continued. The systolic pressure may fail to rise; the pulse pressure may not be augmented, and if the systolic pressure rises, it fails to remain above the original record, after the fall in pulse rate. These several variations do not, of course, appear all in the same individual, but it is safe to assume that should any of these alterations be detected, there is a definite lessening of circulatory efficiency, which, however, does not indicate myocardial defect, since it may be due simply to vasomotor instability, which may fail to support the systolic blood pressure even in the presence of an accelerated pulse rate. I find this test quite valuable as a guide to the time when exercise may be safely permitted in patients recovering from a variety of acute infections, as well as in decompensated heart cases, and myocardial involvement of toxic origin.

TABLE I—NORMAL AUSCULATORY POINTS AND PHASES

1st point	no sound	
1st phase between	8 to	10 MmHg.
2nd point		
2nd phase between	14 to	16 MmHg.
3rd point		
3rd phase between	18 to	20 MmHg.
4th point		
4th phase between	3 to	4 MmHg.
5th point	Silence	
Systolic between	120 to	125 MmHg.
Diastolic	77 to	75 MmHg.
Pulse pressure	43 to	50 MmHg.

TABLE II—NORMAL AVERAGE SYSTOLIC AND DIASTOLIC BLOOD PRESSURES IN CHILDREN

Age		*Systolic*	*Diastolic*	*Pulse Pressure*
7 to 10	Boys	98 MmHg.	61 MmHg.	37 MmHg.
	Girls	93 MmHg.	58 MmHg.	35 MmHg.
11 to 14	Boys	107 MmHg.	71 MmHg.	36 MmHg.
	Girls	106 MmHg.	63 MmHg.	43 MmHg.
15 to 18	Boys	112 MmHg.	70 MmHg.	42 MmHg.
	Girls	115 MmHg.	70 MmHg.	45 MmHg.

TABLE III

Age	*Fisk*	*Faught*
20	120 MmHg.	120 MmHg.
23	123 MmHg.	121 MmHg.
26	124 MmHg.	122 MmHg.
32	125 MmHg.	124 MmHg.
35	127 MmHg.	125 MmHg.
38	129 MmHg.	126 MmHg.
47	131 MmHg.	129 MmHg.
50	132 MmHg.	130 MmHg.
56	135 MmHg.	132 MmHg.

Standard systolic pressure levels according to Fisk's Table and as determined by the Faught Formula

TABLE IV

Normal Ratio—

A. SP. 125 DP 85 equals PP. 40— 40 x 3 equals 120
B. SP. 185 DP 120 equals PP. 65— 65 x 3 equals 195
C. SP. 95 DP 63 equals PP. 32— 32 x 3 equals 96

Abnormal Ratio—

D. SP. 160 DP 60 equals PP. 100—100 x 3 equals 300
E. SP. 155 DP 120 equals PP. 35— 35 x 3 equals 105

Pressure readings, A., B. and C. indicating normal 1:2:3 ratio; D. and E. showing disturbance of 1:2:3 ratio, associated with alterations in systolic pressure.

TABLE V—NORMAL REACTION TO EFFORT TEST

	S.	*D.*	*PP.*	*PR.*
Before exercise	105	75	30	64
After exercise	115	75	40	96
2½ minutes after exercise	110	80	30	64

TABLE VI—ABNORMAL REACTION TO EFFORT TEST

	S.	*D.*	*PP.*	*PR.*
Before exercise	150	85	65	80
After exercise	130	80	50	120
2½ minutes after exercise	135	80	55	96

(To be continued)

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Industrial Surgery with Special Reference to the Rehabilitation of the Injured

By Grover C. Penberthy, M.D., F.A.C.S., Detroit

Rehabilitation of the injured opens up a field of work with many possibilities for all concerned in the management and treatment of those incapacitated by injury. The importance of this part of the medical and surgical treatment of the injured was emphasized in the late war although physical reconstruction and the re-claiming of the injured was practiced long before this event. It may also be said that the Workman's Compensation Law has caused the employer to see the need of using every possible means in assisting with the return of the injured employee to a working status in the shortest period of time. Mock points out that such terms as rehabilitation, physical reconstruction, functional re-education, occupational therapy, vocational re-education and many similar terms either sprung into existence or derived a new meaning during the war.

The rehabilitation of the injured in a broad sense of the word begins in reality at the time of the initial treatment after injury. Proper First-Aid may have a great influence upon the ultimate physical result following an injury and an influence as well upon the period of disability. The work of rehabilitation continues during the stay in the hospital and often throughout the period of convalescence. It may run for an indefinite period, even after the work of the surgeon has been completed. Good medical and surgical care is an essential factor. This means competent personnel, tempermentally suited to direct and administer the necessary medical and surgical care. It also means adequate medical equipment for the plant and hospital. The combination of a well trained personnel and equipment should very materially assist in the physical reconstruction, functional re-education and the maximum restoration to useful employment of every disabled individual. It is necessary that those treating the injured employee gain his confidence and by maintaining this confidence throughout the period of disability it becomes a factor which must assist in the return of the injured to work. Having confidence in those directing the surgical care helps also to stimulate morale. The patient in a satisfied frame of mind co-operates and will assist in the reclamation to a large degree.

The special medical and surgical care required in the management of industrial injuries has led to the establishment of hospitals in some centers, equipped to render the necessary care. Many of the general hospitals have established fracture units and provide the necessary special equipment for handling such injuries, which should mean more efficient treatment and a shorter period of disability. Good hospital facilities are very necessary in the rehabilitation of the injured. For example, a patient entering a well organized surgical service with a crushing injury of an extermity which requires amputation, will be operated upon and be given a good surgical stump, fitted early with an ambulatory splint and later provided with a properly fitting artificial limb; a patient entering with a fracture will be given the benefit of modern means available to treat such an injury and if necessary be provided early with an ambulatory splint, or the patient admitted to such an organized surgical service with an infection will receive the attention of one having judgment relative to the proper management of such conditions. Both fractures and infections require early attention to passive and active motion when in the judgment of the surgeon it is safe to begin this. Early motion may be an important factor assisting in the rehabilitation of both conditions. Another example emphasizing the importance of early joint motion—a patient admitted with a fractured femur is treated by skeletal or bone traction. This form of fixation permits some motion of the joint above and below the site of the fracture, which means that when this patient has union of the fractured bone, there should also be movable and not ankylosed or stiff joints in that extermity. The above mentioned conditions are a few referred to because the treatment that should be given will have an important bearing upon the rehabilitation of the patient suffering with the particular condition.

Re-educational work or occupational therapy, under the guidance of one trained to direct this work, is another factor and this can be started early with many post-operative and fracture cases. The patient's idle moments are kept occupied while so engaged and he becomes interested in the new work, which assists in maintaining his morale and naturally this reacts in helping with his rehabilitation. A study of the results obtained in this method of therapy shows that some patients have continued with this work after discharge from the hospital. In some instances it has been a means of making a small income to tide the patient through the period that he has been disabled from his regular line of work.

Physiotherapy is another factor concerned in the rehabilitation. It should be undertaken at an early date even though the patient is confined to bed. Light massage and manipulation, combined with the application of heat to the part, assists in maintaining the tone of the muscle and also benefits the patient from a psychic point of view. Bed ridden and even ambulatory patients may be inclined to think they are neglected, if some form of treatment is not given throughout their period of disability. The patient discharged from the hospital still unable to return to his former

occupation should be referred to the Physiotherapy Department for treatment. In addition to the forms of treatment mentioned above such special treatment as diathermy, electro-therapy and hydrotherapy, when properly administered, materially assist in the reclamation.

The patient receiving physiotherapy treatment can often be returned to his employer for some type of work which might be considered in the nature of occupational therapy. To accomplish this, means of co-operation of the employer. It is the practice of our clinic to establish this contact through the social service department.

A recommendation is made by the surgeon in charge, as to the possibilities and limitation as regards the ability of the particular patient to perform some work. The social service department, in turn, communicates either in person or otherwise to explain this recommendation for work. The interview is usually with the foreman in charge of the department in which the injured employee was working at the time of his injury.

It was our experience early in this follow-up work to learn that there was often a mis-understanding when the patient was discharged from the hospital and advised to return to work. He perhaps reported to the employment department and the head of this department, not knowing what the hospital had in mind, questioned the patient as regards his ability to do his regular work. The patient not feeling able to do his regular work would, as a rule, receive no encouragement to return so he would come back with the usual complaint that his company had no work for him. The interview with the foreman by the social service nurse is one of the important links and an important factor in the chain of events concerned in the rehabilitation of many injured employees.

The part played by the surgeon in rehabilitation of the injured should continue after the discharge from the hospital of the patient who is unable to return to his regular work. A surgical follow-up clinic regularly conducted gives the surgeon an opportunity to note the progress being made or the conditions influencing the disability. Patients seen either in the Out Patient Department or discharged from our hospital are usually advised to return at a specified time for examination. The patient may also receive a postal card requesting that he report back to this clinic at a certain time. It has been my observation that many receiving this card keenly appreciate the interest that is taken by the hospital in his or her particular condition. It has not been my experience to find patients developing into malingers because of the follow-up examinations. Some it is true have mis-understood the meaning of the card, but upon their return they have learned the reason for it. The patient sufficiently recovered, in the judgment of the surgeon to return to some form of work, is immediately referred to his employer for work through the social service department.

The follow-up of disabled patients also permits of reclassification from time to time, relative to the type of work that the patient is able to do. It also permits the surgeon to observe some of his failures. Some un-united fractures or cases of malunion, for example, often run into long periods of disability if not recognized early. Such conditions frequently require operation to assist in the rehabilitation and if operated time and money will be saved. Other conditions requiring surgery can also be observed in such a follow-up and the patient referred for further hospital treatment. The mental impression made upon patients attending such a clinic must be a beneficial factor in rehabilitation.

Conclusions: Rehabilitation as viewed by the surgeon means restoring the injured employee to a former state or capacity. To accomplish this means proper first aid; adequate equipment; good hospital facilities and supplementing the surgical and medical care with occupational and physiotherapy.

The establishment of a regular surgical follow-up clinic for patients discharged from the hospital but not yet able to return to their regular work.

Close co-operation between the hospital or surgeon and the employer to assist in the rehabilitation or re-establishing the injured employee to a working status.

A Survey of Spastic Paralysis

By Dr. Frank E. Curtis, Orthopedic Surgeon

Report read before the Michigan Chapter of the American Physiotherapy Association on Dec. 8, 1931, at the Childrens' Hospital of Michigan Convalescent Home

This report is based on the study of eighty-four cases of spastic paralysis, which have been treated at the Convalescent Home during the past three years. The average convalescent hospitalization period being eight months, and this is somewhat controlled by the length of time between operations.

Types or Extent of Paralysis

Three cases of monoplegia paralysis.

Twenty-three cases of paraplegia paralysis, and two of these were mute.

Twenty-eight cases of hemiplegia, one of which is both deaf and mute.

Thirty cases of diplegia paralysis, six of these were mute.

With the exception of five cases, all have received operative procedures before any treatment was given at the Convalescent Home.

The procedures consisted of the following:

1. *Obtuator Nerve Resection.* The obturator nerve supplies the major portion of the nerve supply to the adductor muscles. A secondary supply comes through the branches from the sciatic nerve. The intra pelvic section of the nerve before is divides into its anterior and posterior divisions is found to give the most satisfactory results. A one inch section of this nerve is removed inside the pelvis at its point of entrance into the obturator foramen. This operation is aimed to restore a balance between the abductor and adductor group of muscles. Extra pelvic section of the branches of this nerve have been done, but with less satisfactory results, and frequently complicating scars interfere with motion following operation. This operation aims to correct the tendency to adduction of the legs, and a full range of abduction is usually obtained.

2. *Popliteal Nerve Resection.* The branches of the nerve to the two heads of the gastrocnemius muscle and the soleus are the branches treated in the procedure. The ordinary procedure is to remove the nerve to the medial head of the gastrocnemius and to the soleus muscle. Enough nerve supply is removed to attempt to obtain a balance between the dorsal and plantar flexor muscles of the ankle and foot.

3. *Lengthening of Tendo Achilles.* The Achilles tendon frequently has to be lengthened, but this never is done previous to the nerve resection, as it is felt that balance between the muscles should be established first. The tendon is lengthened according to the method of Hoke. Other muscles and tendons are lengthened as necessary, following nerve resections to the muscles.

4. The *Biceps* tendon is frequently transplanted into the quadriceps to decrease the flexion of the knee, and reinforce the power in the quadriceps.

5. The branches of the *Sciatic* nerve which supply the internal hamstrings are partially resected in cases with persistent flexion of the knees. The branches to the biceps muscle are not removed as this muscle is frequently transplanted into the quadriceps.

Children are selected for operative procedures if the mentality warrants same. Mental tests and observation in cooperative powers are of value in forming an opinion with regard to operations. All operations are carried out on the lower extermities first, and later on the upper extermities. It is noted that children are less irritable and more cooperative following operation.

Observations Noted Succeeding Operative Procedures

Of the twenty-three cases having the paraplegia type of spastic paralysis fifteen had not walked previous to operation, eight had walked with assistance. All walked when they left the Convalescent Home.

Of the twenty-eight cases having the hemiplegia type of paralysis, only four had not walked previous to operation. All improved, and excellent results were obtained with thirteen cases.

Of the thirty cases having the diplegia type of spastic paralysis, only two had walked previously. Eleven are able to help themselves as far as locomotion is concerned. In six cases the intelligence quotient was too low to gain any apparent results which could be termed as improvement. The others are still under treatment.

In following up these cases which have returned home, it was found that of the twenty-eight pre-school children, eighteen are children who live out in the state, and are brought into the clinic periodically for a check up of their condition. These are reported as showing no further improvement than when they left the hospital. Concerning the other ten, one, a city case reports regularly, seven are irregular, and two have left the state.

Fifteen of the fifty children remaining, are attending schools for special education, and others are receiving treatment at clinics, or from the Visiting Nurses Association. Twelve of these children are still receiving treatment at the Convalescent Home. Six are at the Michigan Children's Home in Lapeer, and one is await-

ing admission. Of these six, four are diplegia types, two are paraplegia in type, and one a hemiplegia.

The type of achievement test used for grading the improvement is according to ability of large muscle groups, rather than specific muscles. 1. Lack of motion due to contraction of opposing group. 2. Spasmodic motion. 3. Voluntary motion. 4. Good voluntary motion. 5. Excellent motion.

It was also found to be necessary to specify whether the motions were bilateral, unilateral, alternate or diverse in coordination.

Summary of treatment given: Twenty-two of the eighty four cases received hydrotherapy treatment. Of these, four learned to float about the pool, and two of the four learned to propel themselves about without assistance, both of these being girls about eleven years of age.

A low vitality and lack of endurance, resulting in more frequent colds and iilnesses seems to characterize a child with spastic paralysis. As a result, pool treatments could be given only intermittently over a greater period of time. This necessitated supplementing the pool treatment with treatments in the gymnasium. In several cases the warmth of the pool seemed contra indicative to the relaxation of the already super-toned muscles.

The most successful type of treatment for spastic paralysis given here seems to be exercises to the soothing influence of music. Active exercises are given whenever the child is able to do them. Competition has been found to be an excellent incentive in the majority of cases. After the routine exercises to the large muscle groups are given, the child is allowed to play, and progressions such as turning sommersaults, climbing stall bars, swinging on the rings, and throwing bean bags, walking and marching is given. Stress is placed on the child's ability to care for, himself wherever and whenever possilbe. Thus music has been found to be the more satisfying medium for the soothing influence so necessary to the child with hypertoned muscles.

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Essentialness of Galvanism

By Joseph E. G. Waddington, M.D., C.M., Detroit, Mich., Member of the American Medical Authors' Association

Galvanism is the second oldest agency available for electro-therapeutics. Although immeasurably out-distanced in point of time, availability, and natural convenience by many physical therapy agencies—exercise, sunshine, fresh air—galvanism, nevertheless, is indispensable in the office and the clinic. Galvanism, puristically defined, refers definitely to the employment of an electrical current generated and sustained by a galvanic cell or battery. The direct continuous current obtained from a dynamo, commercially and conveniently available through a public lighting circuit, is now the popular source of practically all galvanic applications. This current only differs mechanically from the galvanic by being more or less rippling or pulsatory in character—according to its more or less refined filtration or elimination of ripples or pulses. The therapeutics of the two currents are precisely similar, therefore, for the sake of brevity and clarity, the terms galvanism and galvanic are used in this article, although applying strictly to the utilization of the commerically available D. C.

In order to prove the essentialness of any agency it is profitable to not only demonstrate clinical results not otherwise so positively or conveniently obtainable but—for scientific recognition—it should be possible to educe therefrom a satisfactory, although not necessarily an irrevocable, theory. The analysis of all matter and of all energy—no matter how diverse or multitudinous, is eventually and concentratingly directed towards the atom, which is ultimately resolvable into the all-pervading, ubiquitous electrons and protons. Reversely and correlatively, the synthesis of all matter and energy is initially dependent upon these transmutative particles or electrical charges. In other words: the countless differing varieties of matter or objects are not only decomposable into one or more of less than a hundred elements or simple substances which, so far, have evaded all attempts to further dissect or simplify but, in their final, ultra-microscopically atomic analysis, differentiatingly depend upon the mathematical and geometrical pattern of their component nuclear protons and surrounding or orbital electrons. The addition or substraction of an electron from an atom inaugurates an electrical charge, which eventuates into a chemical change.

The direct continuous current is a steady flow of electrons, and evinces a positive polarity or plus charge at one end, with an antagonistic or complemental negative polarity or minus charge at the opposite end. It must, thereby, instigate some chemical action and reaction upon and through the tissues traversed by such current. Although all electrical currents, no matter what their modification, indirectly exercise a chemical action, the galvanic or direct continuous current is the only one which is essentially and directly chemical in action and reaction. A direct continuous current cannot be applied to living tissue without disturbing or altering its electrical conductivity and chemical reaction. If the current be of sufficient intensity a visually perceptible chemical change will take place under and in close proximity to the contacting electrodes. A milder current may evince no macroscopic or even microscopic alteration in the tissues, yet, it is logically conceivable that in its passage through such tissues some physiological or pathological response should have, at least transiently, evinced itself.

Ionic medication or the electrical deposition of certain chemicals and drugs into the tissues became popularly applicable through the teachings of Professor Leduc of Nantes. Unfortunately, it has been and still is unscientifically exalted into a panacea by possessors of galvanic apparatus with but limited knowledge of electro-biophysics. Only in a few locally superficial conditions is electrical ionization unmistakably indicated. Endocervicitis and cervical erosions are efficiently treated by the application of a conveniently adapted zinc or silver electrode applied from the positive pole. Unlike the more routinely prescribed swab and irrigation, electrical ionization deposits the sterilizing agents within the tissue itself; there to be retained for a certain sustained period of therapeutic action. Abscess cavities; empyema (subsequent to drainage); sluggish ulceration; fistulous tracts (where the ionizing solution acts as a flexibly adjustable electrode); otitis media, are a few illustrative conditions wherein zinc ionization will often prove more convenient and satisfactory as an antiseptic and curative agency than any surgical or superficial and evanescent drug application.

A copper electrode on the positive pole is thus doubly astringent and is also antiseptic; used intrauterine in menorrhagia and metrorrhagia, it will constrict relaxed blood vessels and tone up the dibilitated musculature. Although less direct, it is more convenient and only infrequently less satisfactory to apply a concentrative, small surface electrode over the lower abdomen; with a larger surface electrode—attached to the negative pole—placed directly opposite at the back. The treatment should be of a half-hour duration, with a fair amount of milliamperage, but well within each individual patient's comfortable tolerance; repeat thrice weekly. This same treatment—only reversing the electrodes and the polarity, is equally effective in the antithetical condition: functional amenorrhoea.

It may be difficult, if not impossible, to visualize a current exercising decided polarity or opposing physiological effects in tissues apparently so anatomically removed from the path of direct polar action. According to the atomic and ionic theory, there must, however, be indirect reaction, sequent to direct polar action, within such more or less remotely situate and diversely sensitive tissues. This is indubitably attested to by the clinical results of unimpeachable reporters from medical centers throughout the world.

Nabothian follicles may be easily and painlessly punctured with a sharpened sliver of zinc or a zinc wire, held in any convenient conducting holder attached to the positive pole. A few milliamperes of current for a few minutes, according to size of follicle or cyst, effectually eradicate these common evidences of a chronic inflammatory process of the cervix. Arthritis, mono or poly, additionally to the indicated medication and removal of accessible foci of presumed infection, requires galvanism to quickly relieve pain and, gradually, lessen disability. Acute and sub-acute conditions will call for the constricting, sedative positive pole; the chronic will just as reliably indicate the physiologically dilative, absorptive (and likewise sedative, when thus indicated) negative pole. For polyarthritis, two galvanic apparati may be simultaneously applied and thus enable two joints to be treated within the time limit otherwise allotted to one alone. Two or more electrodes attached to one terminal of an apparatus, although theoretically an intriguing idea, will be found in practice to almost invariably concentrate the current unduly upon one, and not enough upon the other contiguous, joint. Schnee or leg and arm bath electrodes are exceedingly convenient for applying galvanism to the extremities; and may be easily improved by the technician.

Most of the disagreeable symptoms of atrophic rhinitis may be markedly relieved by positive galvanism. Firmly pack one nostril at a time with a continuous strip of gauze, moistened in a 1% solution of zinc sulphate or a 1 in 500 solution of zinc chloride. Contact the centre of this packing with a wire (preferably zinc) attached to the positive pole of a D. C. apparatus. Barely perceptible milliamperage should be used for not to exceed 10 minutes; repeat once or twice a week, according to reaction. Lumbago and other forms of chronic myalgia; chronic neuritis; stiffened joints, traumatic or otherwise, call for negative galvanism. Sodium salicylate or sodium chloride, in 1% solution, may be used to further enhance the sclerolytic and absorptive effects of the negative pole.

Moles, warts, and certain naevi are easily disposed of with negative galvanism penetratingly applied by means of a steel needle. Capillary and cavernous angioma are preferably attached with a platinum needle on the constrictive, positive pole. Superfluous hair is tediously, but surely, eradicated by catheterizing each follicle with a special, bulbous pointed needle attached to the negative pole. At the Royal Free Hospital, London, all fractures are initially referred to the physical therapy department before being reduced. Positive galvanism is applied directly to the involved area for from 15 to 30 minutes. The current is slowly increased from 1, not to exceed, 5 ma. Daily, thereafter, subsequent to reduction and splinting, this treatment is repeated. Pain and swelling are rapidly relieved and earlier return to useful function thereby assured. To improve the nutrition and circulation within the brain in cases of "brain-fag"; cerebral endarteritis; premature impairment of the mental faculties; vertigo; tinnitus aurium; insomnia; chronic headache, and various other more or less definite symptoms apparently dependent upon an impaired cerebral circulation, mild applications of the direct continuous current through the brain have been highly recommended by many authorities, both at home and abroad. Usually the negative electrode is applied over the forehead, and the positive at the neck. Treatments are cautiously initiated and subsequently increased to possibly 5 or 10 ma. for a maximum of 30 minutes; repeat daily or thrice weekly. Pruritus ani and vulvae may be at least temporarily inhibited by electrical ionization; zinc sulphate at the positive; potassium iodide or sodium salicylate at the negative pole, is used as respectively indicated by the acuity or chronicity of the condition.

Galvanism is, without doubt, the most difficult of the electrical agencies to correctly and expertly apply. Its decided chemical and nervous reactions upon the delicately responsive cutaneous envelope necessitate precise recognition of the clinical indications for its use, and similarly precise attention to its application. Surface electrodes must be of pliably absorptive material to intimately contact irregular anatomical contours, and be thoroughly moistened and heated in order to minimize the resistance of diversely conducting, underlying tissues.

It is to be importantly recalled at all times that galvanism, like any other agency, is not only essential where indicated but may quite probably, under varying conditions, require essential adjunctive aid from, not only some other physical therapy instrumentality but, quite as importantly, surgery and drug medication. Correct diagnosis is essential to correct therapy; correct training and experience are correlatively essential to expert application.

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Physiotherapy in the Treatment of Tuberculosis of the Bones and Joints

By Edward L. Compere, M.D., Assistant Professor of Surgery, Division of Orthopaedic Surgery, The University of Chicago

In advocating a program of physiotherapy in the treatment of tuberculosis of the bones and joints I may be accused of a type of heresy and be in danger of being blacklisted by some of my own orthopaedic colleagues.

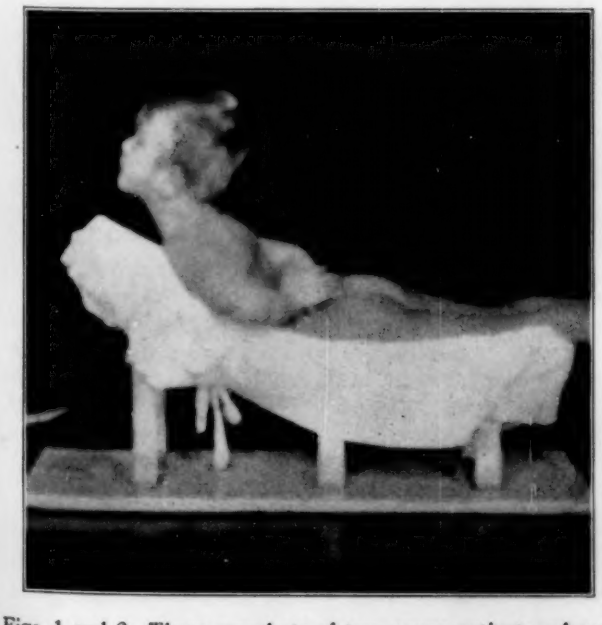
Immobilization of joints which are infected by the tuberculosis bacillus and rest varying in degree from complete bed care to a program of restricted activity is the universally recognized procedure in the treatment of these cases. The controversy has concerned the choice of measures for obtaining the maximum degree of immobilization. Orthopaedic surgeons are divided in their recommendations for operative fusion of joints to insure complete immobilization on the one hand, or the use of plaster casts, splints, Bradford frames, or plaster beds without resorting to surgery.

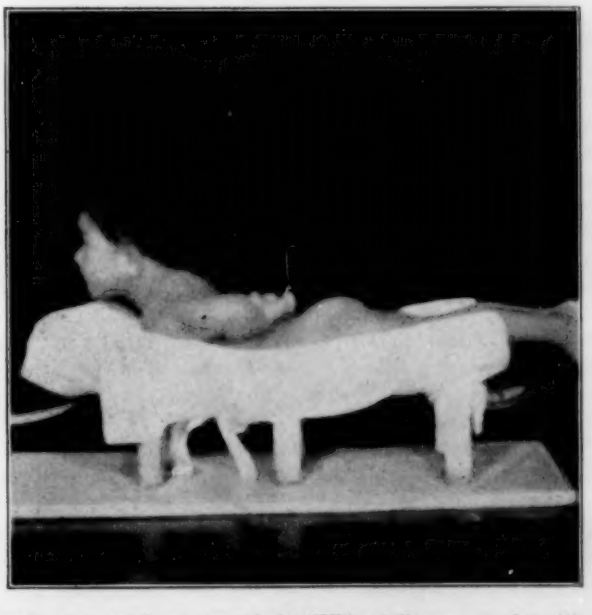
Almost without exception, heliotherapy, consisting of fresh air and sunshine or "sky light," or of some form of artificially produced ultra-violet light, is considered to be an important aid in the treatment of tuberculosis of the bones and joints. It will no doubt surprise some of my readers to learn that such leaders in the work as Allison and Osgood, orthopaedic surgeons who have advocated the surgical excision of the localized lesions in tuberculosis of the joints with fusion of the joint, have also endorsed for these patients a program of exercise and massage.

The rational of such a program as that which I shall recommend may be found by examining the average case of quiescent or recently healed tuberculosis of the hip or of the spine. The marked emaciation or wasting of the affected limb or of the entire body, the foot *drop deformity* with shortened Achilles tendon which is so often present, are not unavoidable sequelae of the disease. Much of the *atrophy* of *disuse* which affects all tissues, muscle, tendons and bone, can be prevented by well directed physiotherapy and to our program of supportive measures this has been added.

Possibly the most important single physiotherapeutic measure is that which results from the exposure of the body to sunlight and fresh air. At the same time that the ultra violet rays of the sunshine activate the ergosterol of the skin so that it can be utilized in the repair of the diseased bones, the *friction of the air* blowing over the bare body massages and stimulates the cutaneous circulation until the skin is suffused with a ruddy and healthful glow.

Deformities may be prevented by mechanical supports, but only by exercise can the extreme atrophy and wast-





Figs. 1 and 2—These snapshots of two young patients, whose spines have been fused by means of the Hibbs-Allison operation, illustrate the type of hyperextension exercises which are a daily routine in the Convalescent Hospital.

ing of disuse be avoided. Such exercise should be both active and passive. The physiotherapist, through a program of muscular massage may further improve the circulation and increase the tone of muscles and ligaments as well as that of the superficial tissues.

Carefully directed active exercises are equally essential. As long as the patient is required to occupy a recumbent position attention must be directed to the care of the regions of the body not locally affected by the disease. Breathing exercises, active movements of arms, extremities and trunk should be a daily routine. We require our young patients who suffer from tuberculosis of the spine to spend at least six months in plaster shells following osteosynthesis of the diseased vertebrae (Figs. 1 and 2). Within a period of six weeks or less after operation, exercises are begun for hyperextension of the spine and so to strengthen the muscles of the back and at the same time inject an added factor for the correction of the kyphosis which is usually present. Head raising and hip flexion exercises improve and maintain the muscle strength of the abdominal wall. Exercises for all four extremities, and particularly for the feet are also a daily routine. This greatly reduces the number of cases of drop foot deformity and of painful plantar arches which are not uncommon when patients who have long been ill become ambulatory.

In the Country Home for Convalescent Children we have at all times from fifteen to twenty cases of tuberculosis of the spine who have had operations for fusion of the diseased vertebral bodies through the medium of their laminae and transverse processes, and who are immobilized, recumbent in plaster shells. An exercise period on the open veranda, where they spend most of each day, has been instituted. Supervised by a competent and trained leader, they do their exercises in groups in unison. In no single instance has this program of physiotherapy interfered with fusion of the spine. We feel, on the other hand, that the improvement in circulation, tissue tone, and in general health as a result of these measures has greatly aided in combating this wasting disease process, both locally and systemically.

Early Diagnosis and Serum Therapy in Poliomyelitis

By William Thalhimer, M.D., Director of Research Laboratories, Michael Reese Hospital

During an epidemic, the diagnosis of extremely early cases of infantile paralysis is not difficult, but at other times, one must be on the alert for this disease. There are certain signs which stand out, and if they are borne in mind will help in the diagnosis. The final act is lumbar puncture, but there are certain things which should be ascertained before that is done.

The history of almost all patients shows that they run a socalled "dromedary" course. There is a rise in temperature for about twenty-four hours, then a return to normal, with a return to well-being, and then about five days afterward there comes the second "hump" in the temperature curve. During the first hump there are no objective symptoms of poliomyelitis; during the second attack (and between the two the child may have returned to school) these symptoms will show up. When ascertaining the history if you learn of the first attack, you should be suspicious. In the second phase, one sees a sick looking child, sicker than one would expect from the temperature, a faster pulse rate than would be expected, pain and stiffness in the neck and the back of the head, or all of these. There may be noticed exaggerated reflexes and muscle tenderness. There may be enlarged lymph nodes, not greatly enlarged and rather generally distributed. When this group of symptoms is present, one should not hesitate to do a lumbar puncture. Increase in pressure is not of as much significance as abnormal findings in the fluid. There is usually an increase of cells, with mononuclears predominating, usually 50 to 200 cells being present, occasionally even more. There is always an increase in the amount of globulin. These spinal fluid findings (if bacteria are not present), taken with the other symptoms, must indicate that the individual has poliomyelitis in the preparalytic stage.

Last summer several patients were seen with this group of symptoms, with no increase in the number of cells, but an increased globulin content; all had palsies; received serum and all recovered. They were seen even before the stage of increased cell count.

What can be done in the way of therapy, whether in the pre-paralytic or early paralyzed stage? The question now under consideration is the place of convalescent serum in therapy, and the place of serum from normal individuals who have in their blood substances which will neutralize the virus. It has been demonstrated by many excellent workers that the serum from the blood of individuals who have recovered from the disease contains these protective virucidal substances (protecting susceptible animals against the virus of poliomyelitis) and that the blood of about 95 percent of people contains these substances even if they have never had poliomyelitis) and in about the same degree as in those who have recovered from the disease. The substances are found soon after the attack of poliomyelitis, exactly how soon is not known, and have been found for as long as twenty years after recovery. Therefore, any individual who has had poliomyelitis can be considered a satisfactory donor of blood and serum. Serum once collected and stored in an icebox will retain these substances for at least a year, and wherever serum is available, it is generally used before that period expires.

The main trouble is getting enough serum. We have two types of serum which have been demonstrated to be virucidal and on the basis of laboratory studies, there is just as much reason for using the normal serum from people who have never had the disease, as for the other. Some tested out normal immune serum was used last summer when the supply of convalescent serum was exhausted. All the serum was tested by Dr. Paul N. Hudson. Serum has been tested from different pools, some pools made from serums from nine different individuals, some from thirty individuals, and all showed considerable virucidal content. Consequently, in time of epidemic, instead of determining by laboratory tests—which take about a month—that the serum has this virucidal content, it is felt that it is safe to collect pools of serum from ten or more individuals and use these pools of serum even without testing them.

There is little or no reaction to these human serums and no harm can be done with this serum as can be by horse serum. There is no strong allergic reaction, and seldom more than a slight rise in temperature. There need be no fear of sudden anaphylactic shock. There is no accurate unit measure of value, and the amount which may be given is limited usually by the amount available. If given intraspinously, one should attempt to give 20 cc. and one can do this only if more than 20 cc. of spinal fluid has been withdrawn. Practically all foreign substances, even normal salt solution, are more or less irritating in the spinal canal, but in no case has this been marked on administration of human serum. The serum also should be administered intravenously, intramuscularly or subcutaneously, and by these routes as much as 60 cc. can be given with complete safety no matter what the stage of the disease, and no matter whether the type is bulbar or encephalitic. There should be restriction of the intraspinous injection in the bulbar type, and also in patients who, though they may have no definite signs pointing to bulbar paralysis, are completely prostrated, because in such cases manipulation necessary for lumbar puncture might be enough to turn the scale in the wrong direction. These patients should receive serum by other routes.

The results of the use of convalescent serum are still questionable. It is generally agreed that the maximum good results are obtained only in treatment of the indi-

vidual in the early stage of the disease. Once marked paralysis has developed, one cannot hope for much, and in the advanced disease practically nothing. However, it is believed that there is no other therapeutic agent known which has a logical scientific and reasonable basis. Therefore, the object now is to collect as much serum as possible, supply it where required, and make observations with an open mind.

It has not been possible to evaluate most of the results by the best clinical method, i. e. having alternate cases as controls, although some work along this line has been done in the East, during the epidemic last summer.

There is another therapeutic method to be borne in mind—blood transfusions. This must be used in accordance with the usual requirements for transfusion, and the blood should be taken from an individual who has recovered from poliomyelitis, or if not, from some individual whose blood has been found to contain virucidal substances. If this is not possible, any proper available donor may be used, making sure the donor has grown up in the city, because such individuals are known to have more protective substances than those who have grown up in the country.

While one should be guarded in making statements for or against the value of serum treatment, the fact remains that some cases have shown very dramatic changes after receiving serum. Clinical evaluation is uncertain to be sure, but certain types of clinical evidence are as accurate as laboratory tests, and the opinion of an experienced clinician must be taken seriously.

Observations Regarding Scoliosis Treatment in Milan

By G. Brask

In May, 1931, I spent four days at Instituto Rachitici in Milan, where Doctor Galiazzi permitted me to watch the scoliosis work. I cannot give a detailed report as I had not enough time for a thorough study, but the work impressed me very much. I was somewhat handicapped as the technicians spoke only Italian and I could not ask the questions I wanted to. Doctor Galiazzi and his assistant spoke French, but I felt I could not take too much of their time.

I saw several hundred x-rays (arranged for slides) showing the spines before and after treatment, and the results were most impressive.

It is interesting to study the vastly different methods of obtaining results. You are all familiar with the work of Doctor R. Hibbs and Doctor Stindler in this country. They both warn of the dangers of too much mobilization, whereas it appeared to me that Doctor Galiazzi disregarded these dangers, and did what I was originally taught, in the Swedish method: to use all means making the spinal colum as a whole as flexible as possible. But he wants to know exactly where he is bending and rotating and how much, and so uses very intricate machinery to localize the movements. Some of these machines are Doctor Shulzhess', most of them are Doctor Galiazzi's own construction. The patients are strapped on, and the machine is adjusted in such a manner that they bend just over the right point and exactly the degrees wanted. The same with the rotation. There is no possibility of faulty positions or movements. The patients stay in one machine up to twenty minutes, but there is an active and passive period in each movement, so they get relaxation enough.

In the machine the range of motion is regulated, and also the type of motion, the exact area and by help of weights, the resistance. All of this is marked on the exercise chart from readings on the machine. Each patient works in the gymnasium about two hours daily.

In addition to the described work, Swedish corrective exercises are used, including rather heavy work in stall bars, rings, trapeze, etc., and Doctor Klapp's crawling exercises which are probably the best exercises ever made for the purpose of mobilization. But I cannot here go into detail about the advantages of this system.

Shulzhess has a good apparatus for drawing an exact contour of the saggital variations and of the different horizontal planes. In that way a good picture can be had of the rotation in the sacral, lumbo and dorsal regions. But of course the chief source of information is the x-ray plate.

The plaster work is done in Doctor Galiazzi's special machine x-ray and drawing is consulted, the patient's back is examined and a blue drawing made on the stockinette marking the highest points on each curve.

The machine consists of two independent units, the patient is placed with hips and arms flexed (quadruped position) the trunk is horizontal, the hands placed on a rest under the shoulders (elbows straight) and the forehead is on a rest.

The plaster is applied in two belts, later joined by two intermediary sections. First the pelvic and shoulder girdles are forced into corrective positions and fixed by plaster sections. Then the torso is derotated and flexed and secured to both segments by more plaster.

By help of a plumb-line, the center of motion of the machine is brought directly under the highest point of the curve, and each flexion and rotation is made right over this center. During these manipulations, done by help of screw-keys, pressure over the apex of the curve is secured by a strong band, which one of the assistants places around the waist.

If there are several curves they are taken care of in succession. The time for an application is fifteen or twenty minutes. It is the most exact method of body plaster application I have seen.

Already after the first cast, which is kept on for about three months, there will be a marked change in the x-ray. What impressed me most was the almost unbelievable correction of rotation. The total duration of cast period varies from eighteen months to three years.

Doctor Galiazzi has the finished material of three thousand scoliosis cases. One thing I did not get information on, was the follow-up work. The question: will these corrections hold without fusion? was answered in the affirmative. I did see some x-rays four years after treatment, showing no relapse, but would have liked to stay longer to get more information.

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Fractures of the Elbow and Their Complications

By Eugene B. Potter, M.D., Department of Surgery, University of Michigan Medical School, May, 1931

Read before the Michigan Physiotherapy Chapter, May, 1931

Fractures around the elbow joint present many difficulties with reference to the immediate reduction, the convalescent care, and the treatment of possible complications.

From an anatomical standpoint, this joint varies from the usual in that three bones are involved, the relation of each to the others being of great importance for a completely functional arm. The proximity of important nerves and blood vessels which may be damaged by the fracture also adds to the importance of securing satisfactory reduction of the fracture and adequate care thereafter.

For the purpose of this paper, a consideration of all types of fracture involving the elbow would be superfluous, since the principles of treatment are the same for all types, excepting fracture of the olecranon. We will consider briefly the so-called supracondylar fracture found about the elbow joint.

Supracondylar fracture of the lower end of the humerus occurs a short distance above the enlarged lower end of the bone, and is in close proximity to, but not into, the elbow joint itself. It is produced usually by indirect violence, that is, by a force directed upon the outstretched hand with the elbow in full extension. It is frequently found in children and in this clinic is one of the most common types of fracture in children below the age of ten. In the great majority of cases the displacement of the bone ends is typical, consisting of an anterior position of the long upper fragment, the short lower fragment being tilted backward and rotated by muscular pull.

Either by the fracturing force itself or by subsequent manipulation in an attempt at reduction, one or more of the three great nerves of the arm may be injured, or the circulation of the forearm and hand impaired by interference with the main blood vessels of the arm.

Early manipulation within a few hours of the fracture, is essential for the most satisfactory treatment of this fracture in particular, although the same is true in the vast majority of fractures. Delayed treatment means increased hemorrhage and swelling, and the difficulties are then tremendously increased. As in all fractures near joints, the most perfect functional results are obtained by a completely anatomical reposition of the fragments.

An uncomplicated supracondylar fracture of the humerus is usually immobilized, following reduction, with the elbow in a position of acute flexion and the hand in pronation. Physiotherapy is usually begun as soon as the acute reaction subsides, in the form of baking and light massage when the dressing can be partially removed. Motion at the elbow is usually started at from 5 to 14 days and since the arm is in the position of acute flexion, simply lowering and raising the hand a few centimeters each day is sufficient. This is first done by the surgeon when good union is assured and may then be carried on by the physiotherapist. It is important to remember, I think, that full return of elbow motion, in fractures around this joint, is slow, and particularly in adults, improvement may often be seen up to within a year following the injury.

COMPLICATIONS

Among the most common complications of fracture of the elbow injury to the main nerve trunks of the arm occupy an important place. The median, radial and ulnar nerves are all in anatomical relationship to the lower end of the humerus, and are in jeopardy when fracture of this region occurs. Although the medial nerve is said to be the most commonly affected nerve in this type of injury, in our experience the ulnar nerve is equally as often involved, either by the fracture itself or by manipulative trauma. The incidence of a nerve lesion complicating fracture makes the management of the case much more difficult. The care of the fracture itself, with attention to the joint function must not be forgotten, while added to this, the position and nutrition of the weakened or paralyzed part is of equal importance. Proper splinting of the hand and fingers is extremely necessary, together with baking, massage, hydrotherapy, and electrical stimulation and passive motion to the involved muscles. Adequate and well directed physiotherapy forms one of the most important aspects in the proper treatment of such cases, since complete return of function of the hand and arm often depends upon the physiotherapy instituted during the acute phase of the lesion.

Richard Von Volkemann in 1881 described a contracture of the hand arising frequently as a complication of fracture of the elbow. The lesion is caused by fibrosis of the muscles of the forearm following ischemia or lack of proper blood supply to the part, the result usually of too tight splinting or of pressure from hemorrhage around the joint in an acutely flexed elbow. In a well established case, the muscles of the forearm become stony hard and a claw hand results, similar to that seen in a high ulnar paralysis. The lesion is usually seen in the upper extremity and occurs almost exclusively in children. Without treatment the condition progresses and

a totally disabled hand results. Prevention of the condition is extremely desirable, since after some time treatment of any sort is not wholly satisfactory. Massage and motion alone are useless and should always be supplemented by splinting, the Jones splint being the best of its kind. Since, in this condition, flexion of the wrist permits extension of the contracted fingers, this splint allows first full extension of the fingers, with the wrist flexed, and then extension of the wrist with the fingers held by a splint. This produces stretching of the muscles of the forearm, and may give marked improvement when combined with suitable physical therapy measures. Active voluntary motions of the fingers and hand under water should be encouraged, with heat and massage used to improve the impaired nutrition of the part.

A relatively uncommon complication of fracture of the elbow is the condition designated myositis ossificans. It consists of the deposition of bone elements in the muscles and soft parts surrounding the fracture site, and is usually associated with severe types of fracture having extensive comminution and tearing of the adjacent tissues. Too early or liberal motion of the joint is said to be a contributing factor in its production. A bony mass is formed eventually in the neighborhood of the fracture, often anterior to the joint, which may block flexion of the elbow. The treatment usually followed is immobilization of the joint until the formation of the new bony mass has reached its maximum and to then remove the mass completely by surgical excision. Recently, however, early and continued motion of the joint has been advocated as soon as the condition is recognized, and good results have been reported by this method of treatment alone.

SUMMARY

1. Fractures about the elbow joint are frequently accompanied by serious and difficult complications.

2. Physiotherapy is of invaluable assistance in treating nerve lesions complicating fracture.

3. Volkmann's ischemic paralysis is best treated by a combination of suitable splinting and physical therapy measures.

4. Myositis ossificans usually requires operative removal of the new formed bony mass.

Birth Palsy

By Philip Lewin, M.D., Chicago, Ill.

Dr. Lewin, author of "Orthopaedic Surgery for Nurses," read this paper before the Visiting Nurse Association of Chicago, May 7, 1929. Reprinted by permission from The Public Health Nurse, April, 1930

Birth palsy is that condition present at birth manifested by the inability to use part or all of an upper extremity. It was first described by Erb whose writings, as well as those of Sever and Taylor, are classic.

Etiology—The cause of this disturbance of the neromuscular apparatus is under discussion. The chief theories are those of Sever who believes it is due to injury during delivery, to the nerves of the brachial plexus, which supply the muscles of the upper extremity, and of T. T. Thomas who states that it is due to subluxation or partial dislocation of the shoulder joint.

Pathology—The pathologic changes are found in the nerves of the brachial plexus. Usually at the junction of the fifth and sixth cervical cords, referred to as Erb's point, there is a mass composed of nervous and scar tissue. The tendons of several muscles which pull the arm to the side, viz., the subscapularis, pectoralis major and teres major muscles, are contracted. The inferior or under portion of the shoulder joint capsule is also contracted, i.e., fibrosed.

Symptoms

The symptoms are paralysis of part or all of the upper extremity. There are three recognized types: the upper arm type (Erb), the lower arm type and the whole arm type (Klumpke). The usual type or whole arm type is described as follows: The child is unable to use the arm which hangs limp at the side. The position is one of adduction, internal rotation, pronation and palmar flexion. It has been called the "waiter's tip" position. The whole arm is rolled so far inward that the back of the hand rests against the side of the body and the wrist is bent in such a manner that the palm is turned upward. There is little muscle power in the shoulder and the arm cannot be voluntarily elevated. The elbow cannot be flexed by the child. When the arm is raised the wrist drops downward. The forearm is rolled inward, which position can be unfolded only with great difficulty. The fingers are usually folded over the thumb which lies across the palm of the hand and the child has very little power to open or close the hand. In the upper arm type only the muscles of the shoulder are affected, while in the lower arm type these may be normal and the elbow, wrist and hand muscles are weakened or paralyzed.

Sever says that when the child is first seen, if within a few days or weeks after birth, the following picture is classic of the upper part of the arm type of which there were 400 in his series. The arm lies limp at the side, extended and inwardly rotated, with complete inability to abduct, elevate, outwardly rotate or supinate. The muscles paralyzed in the typical upper part of the arm type are as follows: deltoid, supraspinatus, infraspinatus, teres minor, biceps and supinator longus and occasionally the serratus magnus coracobrachialis and supinator brevis. The arm cannot be actively flexed at the elbow, but as a rule the lower part of the arm is not affected so far as flexion and extension of the wrist and flexion and extension of the fingers are concerned.

The inability to raise or abduct the arm at the shoulder is due to the paralysis of the deltoid and supraspinatus; outward rotation cannot be accomplished because of the paralysis of the infraspinatus and teres minor, and the arm cannot be internally rotated because the internal rotators—namely, the teres major, the subscapularis and latissimus dorsi—are contracted, owing to lack of opposition.

The arm cannot be flexed at the elbow as a result of the paralysis or weakness of the biceps, brachialis anticus, coracobrachialis and supinator longus; and supination cannot be carried out owing partially to the inward rotation in which the arm is held, and the weakness or paralysis of the biceps and supinator longus or brevis.

Lewin and Arkin have described another type in which the opposition position is found, *i.e.*, abduction of the upper part of the arm and flexion of the elbows.

The roentgen-ray findings are usually negative except in those cases in which there is a disturbed relationship between the bones of the shoulder joint, at times resembling and at other times proving a dislocation.

Diagnosis—The diagnosis concerns chiefly the distinction of the various types.

Prognosis—The prognosis is usually good, especially if treatment is carried out by the mother as well as the nurse. Some cases of seemingly total paralysis may turn out surprisingly well. There is great variation in the length of time that treatment is required. In most cases, progress is slow.

Treatment

Treatment should be started immediately upon the recognition of the condition. It may be discussed under prophylactic measures, which means careful obstetrics; and curative measures which are divided into non-operative and operative. Curative methods consist of light massage, careful stretching, gentle manipulation and retention in a corrected position. This is abduction of the

shoulder to 90 degrees outward rotation of the humerus, flexion of the elbow to 90 degrees, complete supination of the forearm and dorsiflexion of the wrist. The best means of obtaining this position is the brace designed by Sever. While the brace is being made, a plaster of paris cast may be used. It should be made removable by splitting and the application of straps and buckles. It should be removed twice daily for massage, manipulation and active or passive movements. Muscular education is most important and results are usually slow.

When a new-born child is found to have paralysis of an arm it should be treated by a simple padded bandage loop around the wrist with the ends tied to the head of the crib, maintaining a position of abduction and external rotation of the arm. Measurements for a brace should then be made.

The exercises may be given more freely when the brace is obtained. The brace is worn continuously day and night. It is removed for massage and exercises only, *i.e.*, once or twice a day. The condition of the arm should be watched closely to see that no contracture of the opposing set of muscles is developing. For example, if the arm is being held in an outwardly rotated position for a time, the muscles may tighten up so that inward rotation is limited. In such a case the position of the lower arm in the brace may be changed temporarily from the vertical to the horizontal position. The exercise to roll the arm in must be given instead of the opposing movement which was necessary before. The muscle which bends the elbow may become tight from holding the arm in a right angle position and will not allow the arm to be straightened. In this case the arm will be straightened out in the brace and the exercise to straighten the arm will be given in place of the one to bend it.

Operation is occasionally necessary, and the most successful method is that of Sever, which consists of cutting the tendons of the subscapularis, pectoralis major and teres major muscles. (The technic of operation will not be given.)

EXERCISES TO RHYME

The exercises are often given to rhyme or song which engages the baby's attention and stimulates interest in the movement desired. Any suitable rhyme may be used but the same one must be used consistently with a given exercise. At first the operator moves the child's joint, then she makes the movement herself and encourages the child to imitate her.

Each finger and thumb are straightened and bent, accenting the motion which is more difficult for the child to perform. The following rhyme may be repeated or sung during the exercises:

"This is little Tommy Thumb,
Round and fat as any plum.
This is little Peter Pointer
He must be a double jointer.
This is little Tobby Tall, he is the biggest one of all.
This is little Ruby Ring,
She's too fine for anything.
And the little wee one, maybe is the little finger baby."

The opening and closing of the hand may be done while repeating:

"The little birdies in their nest,
Go hop, hop, hop, hop,
They try to do their very best,
And hop, hop, hop, hop."

To raise the wrist from its dropped position, sing:

"This way, that way, blows the weather vane,
This way, that way, blows and blows again.
Turning, pointing, ever showing,
How the merry wind is blowing."

To bend and straighten the elbow:

"Up, down, up, down, this is the way we go to town.
What to buy? To buy a fat pig.
Home again, home again, rig-a-jig-jig."

Raise arm over head with block in hand, tap wall behind head saying:

"Pound for the baby, pound for the baby, pound, pound, pound."

Holding block in hand, throw outward and back saying:

"I get it, I get it."

The child may also be taught to play "Peek-a-boo," to comb its hair with the affected hand, also to shake a rattle. An object is often held above the child's head to interest the child in reaching for it. Some of the mothers add original exercises to those described above. Raising and lowering the window shades and pulling the electric light on and off are some of the play exercises which are very beneficial. All of these assist in maintaining the interest of the child in the treatment.*

*The author wishes to thank Edna L. Foley and Coralynn Davis of the Visiting Nurse Association for many valuable suggestions in the writing of this article, including the rhymes that were used originally by Mary Trainor of the Children's Hospital, Boston.

The Management of Defective Foot Posture

By C. W. Peabody, M.D.

It is probable that defective foot posture occupies more of the attention or the time of the majority of physiotherapists than any other single condition. While infrequently a crippling or disabling condition, it nevertheless leads to a very improtant amount of impaired physical efficiency in its direct and indirect effects, and often to prolonged misery and consequent nervous exhaustion. Witness to the above is seen in the efforts of the shoe trade to meet the problem presented by the throngs of people that ceaselessly appeal for relief from these troubles through some special form of footwear. The orthopaedic surgeon in his adult practice constantly finds this problem at his door, and in war time, the medical department, appreciative of the potential physical inefficiency to be expected in the presence of defective foot posture, and so on the look-out for it, was greatly concerned with the high incidence of this defect. It should not be necessary to go into detail here as to the way in which this condition brings about its undesirable effects, including not only the local symptoms in the feet themselves, but also the indirect effects from disturbed statics on bodily mechanics as a whole, with possible knee strain, back strain, fatigability, mental irritability and nervous exhaustion, conditions which often basically underlie the development of quite serious disorders of both the skeletal and visceral systems.

On the other hand, there are few conditions which the physiotherapist has to treat that under proper orthopaedic management will give as definite results in the majority of instances as defective foot posture. This is most emphatically the case of course when dealing with children or young adults, hence the increasing emphasis on the recognition of defective foot posture in early life and before it has become symptomatic.

In the proper management of defective foot posture it is necessary to start out with a careful analysis in each individual case of the possible factors underlying this disturbance of normal function. These may be classified under three main headings in inverse proportion to their frequency: (1) articular pathology, (2) structural or mechanical defects, (3) muscular (physiological) defects. The first two may be thought of as having positive causative factors and the third a negative causative factor in all but a minority of instances.

In considering group one, articular pathology, we must of course be more on the watch in adult cases than in children, for this group means arthritis, either traumatic or inflammatory. The mechanism here, at the outset, is joint pain or sensitiveness with inhibition of normal muscular control, followed either early or late by vicious muscle spasm of the evertors, and sometimes by adhesions and mechanical limitation of motion.

Group two, primary structural mechanical defects, includes congenital deformities of the skeletal structure, which produce either limitation of motion and incorrectibility, or anatomical variations which interfere mechanically with effective muscular control. It also includes acquired structural defects both in foot and leg, sometimes residual from rickets and sometimes from more gradual alterations in bony structure consequent on factors in group three.

The third and largest group in defective foot posture presents physiological considerations only, namely, improper muscular function. In the great majority of instances it represents habitual improper or ineffective use of potentially normal musculature, and in lesser frequency some degree of acquired defect in muscle capacity, i.e., partial paralysis or paresis. These two types of cases have their defective foot posture as a result of negative influences. Another type falling in the physiological classification includes those of a positive character, such as chronic spasticity of central nervous system origin, and non-neurogenic muscle tightening such as the so-called short Achilles cases. Localized reflex spasticity of evertors is included in group one, as it is always secondary to joint pathology.

So as each new case of defective foot posture presents it must be analyzed and classified from the point of view of diagnosis before determination of proper treatment can be arrived at. As can be inferred from the foregoing, this procedure of diagnosis may often include some valuable and necessary information in the way of history and symptoms. We will discuss in detail however only the physical findings. A great deal of information in every case is obtained on simple inspection of the individual, standing and walking. We must observe the whole lower extremity, taking into account its complicating effects on the mechanics of the foot posture both genu valga and genu vara, and most especially the low tibial varus, which when of any considerable degree presents a mechanically insuperable obstacle to normal foot posture; for obviously the maintenance of normal relations at foot and ankle in a sharp low bow leg are physically impossible unless the individual stands solely on the outer border of the foot, i. e. apposition of the sole of the foot as a whole to the ground can be accomplished only by more or less pronation. This does not alter the fact that the statics are defective, chronic strain inevitable; and with a not infrequent degree of leg deformity there may be an actual—and of course painful —pseudarthrosis between the tip of the fibula and the lateral surface of the os calcis. (Hence the concern of the surgeon over tibial varus in children.)

Our observation passes on to the foot posture itself, as to whether we have a high arched foot with ankle valgus and pronation (likely to be highly symptomatic)

or a low arched foot with little or no pronation (i. e. little or no static defect and unsymptomatic). We evaluate the static defect by the degree with which the perpendicular axis of the leg passing into the foot is diverted from the mid-dorsum behind the second or third toes inward and toward the mesial border, or we may estimate it by the evidence of pronation of the calcaneous indicated by the axis of the lower achilles when viewed from behind. We note how much the posture varies standing and walking, and whether it remains the same when the weight is mainly on the one side or the other—i. e. the suggestion of rigidity in the foot.

We look for abnormalities of outline, the amount of convexity of the mesial border of the foot, and whether there is a sharp mesial projection at the head of the astragalus or at the corresponding aspect of the scaphoid. We look for evidences of muscular activity where the tendons may be seen subcutaneously, particularly the two tibials on the one hand and the peroneals on the other. We watch to see whether the toes are flexed against the floor with weight bearing, or whether they tend to curl back.

After satisfactory inspection we turn to examination of the foot by manipulation and palpation. The range of passive motion is ascertained, and the degree of correctibility, and whether this is impaired by structural mechanical resistance or by muscular spasm or shortening, and whether it is accompanied by pain. By palpation we also ascertain capsular and ligamentous tenderness or thickening, and when evidence suggests an arthritis of inflammatory character we should gauge its activity by the surface temperature. By palpation we also can usually diagnose the presence of congenital variations, such as the elongated or supernumerary scaphoid bone (with ensuing consideration as to the significance of external form or to impairment of invertor function.)

Having determined that correctibility is complete and not interfered with by peroneal spasticity or by "Achilles" spasticity or shortening, we proceed to evaluation of active corrective capacity, i. e. the presence of normal contractile power in the invertor groups, i. e. the two tibials and the toe flexors, both as to their intrinsic strength, and also to the capacity or ability to bring them into play properly in the weight bearing and walking positions.

By this analysis of the presenting situation we can classify the individual case as to the main group in which it belongs, and hence the general aspects of treatment. In the consideration of treatment, I will merely touch on group one, i. e. cases of articular pathology, for these concern measures of orthopaedic surgery primarily, and physiotherapy secondarily. Obviously general medical concerns are of primary importance, and not too long deferred must come protective measures, either complete rest and immobilization in an acute phase, or protection by partial immobilization with strapping or by mechanical support. In the chronic phase forcible correction of deformity, loosening of adhesions and stretching of tendon contractures secondary to the joint pathology may be indicated. Later come physiotherapeutic measures, such as heat and massage, and finally muscular re-education.

Group two, cases of structural mechanical defects, also concerns the surgeon primarily. Skeletal distortions in the foot limiting correctibility, which usually center in the head and neck of the astragalus, require either surgical correction or dependance in a palliative way on some form of permanent support. One mechanical defect which has long been associated with discouraging results from training and reeducation, namely, the elongated or "accessory" scaphoid bone, has just lately been recognized in its real effect on function through its involvement of the termination of the tendon of the tibialis posticus resulting in a false and ineffective point of insertion of the latter. Operative treatment has in two clinics in Detroit given most definite and satisfactory results in this condition.

It is in the third and by far the largest group of individuals with defective foot posture that physiotherapy plays the dominant role in treatment. In this group however I have included two positive types that require active intervention by the surgeon. One of these types is the neurological spastic, in which foot posture is looked at not from idealistic standards, but from the essentials of locomotor capacity, and to obtain same frequently requires combatting the spastic valgus by braces or by surgical work on tendons or nerves. The other positive type presents the so-called short Achilles tendon, which of course is not a shortened tendon but a shortened muscle belly, a physiological rather than a structural pathological change. , Such an individual accommodates for what would be a mild equinus deformity by pronation and eversion, the foot bending in mid tarsus instead of at the ankle joint. It is rare that this shortening cannot be overcome by gradual stretching either through physiotherapeutic manipulation or by apparatus, and although surgical lengthening is a quicker way, it is no more permanent in its result and in event of recurrence leaves a condition more difficult to treat.

As indicated above simple relaxed foot posture presents more examples than all the rest of the cases put together and in this group physiotherapy is the main resource in treatment. Its modalities are of course massage, muscle development and postural training, but these comprise a technic for which skill, experience, personality and patience have to be highly developed. It is unfortunate that this regime is so often lightly considered as just "exercise work." In untrained hands "exercise work" may not only be futile but even vicious in its results. Too often do we see individuals told to practice standing on tiptoe or walking on the balls of the feet. No more unfavorable exercise could be given, for the effect is simply to over-develop the ankle flexors, essentially the Achilles group, at the expense of what is really desired.

In major grades of defect any walking exercise should be postponed in the program until not only are the invertor groups developed to a high point of muscular efficiency intrinsically, but also have been trained in coordination. Furthermore it is often futile to expect any progressive development of this strength and control while unconscious habit posture continues faulty. The tibial group in particular in individuals with markedly defective foot posture have acquired a state of normal or optimum physiological tension in a stretched out or elongated position. Under normal conditions a last protective barrier against habitual overstretching is found in the elastic tension of ligaments. These as well as the muscles may be so stretched out that it is often advisable to provide an opportunity for accommodative shortening, or picking up of slack, by a period of externally maintained over-correction, and the orthopaedic surgeon for this reason may elect to start treatment with a period of fixation in overcorrection. This phase may be followed, or the program may be initiated with protection in weight bearing by the artificial support of braces or foot plates. The weak-foot brace or foot plate of Whitman is often a very valuable aid in the corrective program. It requires considerable experience and skill, both of the surgeon and the brace maker in its design and fit; but by utilizing in it the principles

of three point support and leverage, it may be made a very effective corrective device, and should properly be utilized not as a support to the arch, but as a supination brace, adjusted to require an increasing amount of muscular effort to accommodate to it. An important accessory aid in postural training also is found in the "Thomas" raised heel, of which the important function is in directing proper weight distribution and proper gait, and the individual should be taught to appreciate this effect. Proper footwear is of course an essential to effective use of the foot, and in the training period the sudden change from helpful adjuvants in shoes or foot plates to "sneakers" or "gym" shoes may undo much that has been accomplished. In training the emphasis must be placed on constant and unremitting use of the feet in the proper position; so that any barefoot walking is done in as conscientiously corrective position as if the individual were demonstrating before the physiotherapist.

While it is true that there will be occasionally met individuals who never succeed in acquiring postural control of what otherwise may be normal feet, and who will require surgical intervention to prevent defective posture by partial stabilization, it is the writer's experience that these are a small minority, and that granted adequate cooperation, sufficient perseverance, the requisite skill and knowledge of the physiotherapist, with appropriate orthopaedic management and supervision, the desired results will be achieved. As intimated at the outset, in this program the physiotherapist plays the major role, and an absolutely indispensable one.

Detroit, Mich.

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EDITORIALS

Eleventh Annual Convention of the American Physiotherapy Association, Milwaukee, Wis., June 27-30, 1932

Fancy enjoying our eleventh annual convention, at the gateway of "the beautiful land o' lakes"; where three rivers, the Milwaukee, the Kinnickinni and the Menomonee, join to form the finest and most picturesque harbor of the Great Lakes! From time immemorial this fascinating "Man-a-wau-kie" (good and beautiful land) has been a favorite meeting place for the tribe of "Ouisconsin," and the record of successful national conventions subsequently held here, bears out this old tradition. This famous metropolis of Wisconsin, while our nation's twelfth in size (810,000), and the seventh industrially, with a position of versatile supremacy in industry, education, and civic progress offers all the advantages of a modern city, and at the same time preserves the unique charms of a cosmopolitan city of the old world.

The well-deserved fame of this city, and in fact of all Wisconsin, "the playground of the Middle West," is emphasized in order that many of our guests may plan to vacation, after our busy and instructive convention, in this celebrated haunt of varied natural beauties. The scenic charm of Milwaukee and Madison and environs will stimulate you to stay on and enjoy other Wisconsin regions. Splendidly constructed highways are predominant to afford access to the 8,000 delightful lakes scattered throughout our glacier ploughed, forest covered state and the well-known Wisconsin Dell territory.

TRANSPORTATION SUGGESTIONS

Be sure that your train ticket is purchased at special summer excursion rates, to Madison (with stop-over privilege in Milwaukee) as our program includes a trip there on Wednesday, during which we will lunch and dine en route (stipend for eats—$2.50 per each). We shall be met by ye sight-seeing bus ($.25) which will afford our guests the opportunity of seeing our Capital City on our trip to the University hospital and back to ye depot. The beauties of Madison impress even the foreigner in our midst, and are described by the poet-professor W. E. Lenard, formerly of "The Hub" (Boston, of course). Our State Capital building is situated in the center of the city. The State University of Wisconsin is also very much in evidence, and its picturesque campus covers a hilltop from which inspiring height a bird's-eye view of the lake-studded environs can be enjoyed. Just a word to those who drive to the convention, and who will join our party to Madison by train; for them this excursion will total $5.50, which includes the meals on the train and ye sight-seeing bus.

THE CONVENTION HEADQUARTERS—HOTEL PFISTER

Your train will set you down quite on the very lake shore (Chicago, North Western depot) and a few steps to the west will bring you straight to our headquarters, Ye Pfister Hotel, the two upper floors of which have been engaged for our activities. Here you can enjoy the atmosphere of the traditions of quaint old Milwaukee, where the windows give on the blue tang of the near-by lake. We are all familiar with the phrase "reasonable convention rates," but here the phrase holds good, because our progressive state government protects you against special convention increases. An idea of the rates may be gained from the following: Room and bath for three persons at $2.50 per person. Room and bath for two persons at $3.50 per person.

OUR CONVENTION EXHIBITS

This year we are enlarging this feature of our convention, exhibiting more phases of physiotherapy. To this end we urge that more material be exhibited from each chapter. Much progress has been made in the medical field and consequently in our activities, which has resulted in an increased application of scientific technique in our schools, hospitals, clinics, the realm of home treatment, and other departments. All such progress made by individual members and groups can

add to the efficiency of our work as a national force if it is brought to light at our national get-together in June. Many of us realize that handicapped individuals are prone to be obsessed by tenacious superstitions with regard to their condition which keep them from securing the fullest benefits of our therapy. Most of us know of parents and guardians who hide these unfortunates when the doctor visits the family, thus depriving them of the treatment which they need and deserve. This phase of our educational work will receive special attention, and your cooperation is urgently needed; reports of such cases from your locality or elsewhere are requested. WILL NOT EVERY CHAPTER ASSUME THE RESPONSIBILITY OF SENDING CONTRIBUTIONS TO OUR EXHIBITION: address communications to Miss Elizabeth Jones, in care of the Pfister Hotel.

The convention will conclude with a banquet ($2.50) on the top floor of the hotel viewing a delightful expanse of the city and Lake Michigan.

The Wisconsin Chapter is looking forward to entertaining you and hopes that each member will make every effort to attend this convention and to stay on afterward for a portion of their vacation. We plan to make it socially and professionally worth while.

LUCY E. BLAIR, Publicity Chairman.

The Legislative Committee of the American Physiotherapy Association wishes to call attention to Bill H. R. 155. an amendment to World War Veterans Act of 1924, introduced by U. S. Representative Crail before the 72nd Congress, December 8th, 1931.

In this disability bill Mr. Crail has included Physiotherapy Aides who served in base hospitals overseas. It would be advisable for A. P. A. Chapters and Physiotherapy Aides who served in hospitals overseas to investigate this bill and give their support.

Signed: MATHEA BOXETH,
Chairman, Legislative Committee.

There is a vast difference between physical education and physiotherapy, and yet they are often confused. There are many physiotherapists who seem to question where to draw the line between these two specialities.

One reason for this confusion is that a great deal of health instruction is given under the name of physiotherapy. How often a physiotherapist in a school for cripples will say that every child enrolled in the school is receiving physiotherapy, when what is really meant is that every child is receiving some sort of health instruction. The physiotherapist may be trying to improve the general health of the children, but this is not physiotherapy, for many of the conditions would contraindicate physiotherapy treatment. The impression is given, however, that this health instruction is physiotherapy.

Again all chapters occasionally receive applications from physical education instructors who are giving individual exercises for postural conditions which do not require medical supervision. The question arises as to whether such individuals are eligible for membership in our association. Are they not treating abnormalities with exercise and possibly massage, and therefore practicing physiotherapy? They may be using physiotherapeutic measures, but unless such treatment is given under medical direction it cannot be classified as physiotherapy. Furthermore, the conditions being treated are not real abnormalities but apparent ones which may be overcome by encouraging proper health attitudes, and developing desirable health habits. If they cannot be overcome by these means, the instructor should not be treating them.

Physiotherapy, according to our constitution, is defined as the treatment of disease by non medicinal means comprising the use of physical, chemical, and other properties of heat, light, water, electricity (except Roentgen Rays and radium), massage and exercise.

Physical education on the other hand, or health education as it is now called, has been defined by a joint committee of the American Medical Association and the National Education Association as the sum of experiences in schools and elsewhere which favorably influence habits, attitudes, and knowledge relating to individual, community and social health.

From these two definitions it is evident that physiotherapy and physical education have two different objectives. Physical education is concerned with health, and deals with normal individuals. Its purpose is to keep them well, and it is therefore preventive medicine.

Physiotherapy, on the other hand, deals with disease and abnormal individuals. Its purpose is to improve their condition, and make them as well as possible. It is therefore not preventive medicine, but is associated with the practice of medicine.

My Impressions of the Hague Conference

By Hilda Stickley

The Second World Conference for Crippled Children was held at the Hague, Netherlands, June 29 to July 3, 1931. It would be hard to imagine a more delightful atmosphere than that of the Hague Conference, when on June 30th, Miss B. and myself arrived to attend it.

Here representatives from twenty different countries were to assemble under the patronage of the Queen Mother and His Royal Highness the Prince of Netherlands. An atmosphere of graciousness and cordiality on the part of the Dutch people and the delegates enveloped us from the moment of our arrival.

The meetings of the Conference were held in the Knight's Hall, off the Binnenhof, a building quite frequently used by the Queen of Holland to convene parliament. This royal hall added welcome and hospitality to the eager group of visitors.

We found very few of our countrymen present, but this fact was soon forgotten because of the sincere interest shown us by our new acquaintances.

The sessions began quite promptly in the morning and lasted until late afternoon with a short intermission for luncheon.

An interpreter attended each meeting, giving a summary of most of the speeches, often in three languages, usually, English, German, and French. Fortunately for us, we were able to obtain many of the speeches in English from the secretary before the opening of the session.

The speeches were read and the largest contributions were in French and German. It would be impossible to give a detailed report of the subject-matter presented in a five day conference, but I shall attempt a brief summary of some of the outstanding papers from the various countries.

HOLLAND

Dr. Mark Jansen discussed the problem of growth changes from the embryonic life to adolescence and presented for serious consideration the obnoxious influences retarding growth development. Rickets was emphasized by Dr. Jansen as one of the most injurious influences, and I shall quote from his paper on this subject.

1. "The severe degree of feebleness of growth is rachitis or rickets. It is characterized by severe muscular weakness, i. e. an insufficient development of the muscles, and a retardation of skeletal growth. Moreover, the bony parts are soft and insufficiently differentiated. The long bones tend to form in curves; the spine tends to develop the most disfiguring of all deformities, the hump-back."

2. "The slight degree of feebleness of growth is characterized by weakness of the musculature, manifesting itself in insufficient development of the feet, prominent abdomen, round back, and bluish hands and feet, four symptoms of muscular weakness, shortly termed, the "muscle quartet." There is undue length-growth during adolescence."

3. "The moderate degree of feebleness of growth is represented by the knock-kneed child, which is neither too tall nor too small. There is muscle weakness and there is retardation of growth only in the growth discs near the knees which grow faster than all other parts of the skeleton. The lateral side of these discs, being the site of the greater pressure, grows less than the mesial side. The frequency in Holland of knock-knees in young children of our day is startling; indeed, it is so high that straight legs in the young child are the exception. Many people nowadays even consider the development of knock-knees as a normal phenomenon in the child that has just learned to walk. Therefore, the war waged against rickets should not begin after birth but during gestation, and even before than, by the hygiene of the parents."

Dr. Jansen stated that he has found an increase in height among the recruits in the Dutch army in recent years. He thinks that this slender type shows the characteristics of muscular weakness, the causes of which should be investigated.

ENGLAND

Mr. Watson, known to us as the editor of the Cripple Journal, which was discontinued last year for lack of financial support, gave an address, "Propaganda and an International Clearing House." Some of the objectives presented by Mr. Watson are as follows:

1. To promote publicity; any course such as Dickens aroused in England with his writings "Tiny Tim," etc.

2. To formulate plans for the education of the public in regard to causes and prevention of crippling conditions.

3. To stress prevention rather than compensation.

4. To encourage a public conscience for the employment of adult cripples.

5. To create an international clearing house for the mutual benefit of all countries, so that orthopedic discoveries, operative technique, and improvements in apparatus can be common property for the good of all.

6. To establish local working organizations wherever there are handicapped children.

7. To solicit support for the work from the lay public.

Miss Shelly Barker, Secretary of the Central Council for the Care of Cripples, read a paper "The Voluntary System of Cripple Care and Its Advantages." Miss Barker gave a detailed report of the voluntary system

as applied to Great Britain, ways and means of obtaining money, and the general policy of dispensation. It was my pleasure to observe later this system which seems to work out so well in England.

GERMANY

The Queen Mother of Holland honored the German session with her presence, which made this meeting quite impressive. The speakers from Germany and Austria gave some splendid reports on the work in behalf of the handicapped children and adults in their countries.

Dr. Mommsen, Orthopedic Director of the Oskar-Helene Home, Berlin, read an excellent paper on the training of the handless and armless cripples. Dr. Mommsen stated that handless persons are sent to their institutions from all parts of Germany and that at the present time forty-five cases have been rendered self-supporting.

Dr. Mommsen described the task of developing the unmaimed parts with the use of apparatus to compensate for each loss of function. He emphasized the importance of a second aim in the rehabilitation of the handless, the contribution of developing a new personality in some measure able to enjoy again the real happiness of life.

The film he showed illustrated a man, with the loss of both hands, able to perform the acts of dressing, washing, brushing teeth, and eating without assistance by means of mechanical devices.

Dr. Wertz continued the discussion from an educational, social, and cultural point of view. He stated that after giving to the patient the best possible function, they expect the same healthy reaction of a normal person rather than self-pity.

Some of the cases he cited were most interesting and their feats of performance astonishing. One accomplished performer was able to play cards, dice, was an excellent pistol shot, and wrote of herself in rhyme:

"Seeing that I, by God's decree,
Without hands, fingers, arms must be,
And thus by self-help struggle through,
All these things with my feet I do."

Another handless woman wrote of herself in verse:

"Behold the maiden here within,
Who can make knickknacks and can spin,
Can fashion garments without hands,
And is shown throughout many lands."

SWITZERLAND

Dr. Rollier gave a very instructive talk, which he illustrated with excellent slides, on the treatment of surgical tuberculosis at Leysin, Switzerland. Many patients of the working class are given the opportunity of recovery and at the same time are rendered partially self-supporting. The bed patients are immobilized with very little apparatus, and operative procedure is avoided as much as possible. The hours of work are prescribed by the physician and increased gradually as the condition of the patient warrants. Most of the work is done in large solaria, which serve as workshops and places for general heliotherapy. The work is assisted by portable motors used at the bedside on movable benches.

Dr. Rollier states that the occupied patients are very happy, eager to work, and do not complain of the length of time necessary for recovery.

The activities followed by the male patients involve slight muscular strength. They are able to do fine mechanical work, such as, gluing, boring, tapping, manufacture of small clocks, regulation of fine scales, telephone counters, and orthopedic appliances.

The female workers do fine hand work, knitting, weaving linen and other domestic articles. The sale of goods is somewhat of a problem at times but is greatly assisted by the interest of the Swiss people.

UNITED STATES

Mr. Allen in "Developing the World Movement" summed up the activities in behalf of crippled children. He reviewed for us the results of the First World Conference, resolutions adopted by the International Society of Crippled Children, and the Children's Charter adopted by the White House Conference of 1930.

Mr. Allen stated briefly our attempts to change statistics and to attain our goal for the handicapped children in the United States and Canada. This message conveyed to us that usual spiritual inspiration so characteristic of Mr. Allen's addresses.

Dr. Bracket of Boston was the only orthopedic surgeon from the United States whose name appeared on this very interesting program. Dr. Bracket was unable to be present, but his paper was read by another representative.

In "The Need of the Normal Community Training for Cripples" Dr. Bracket states that, "the relief of the physically handicapped is but one part of the problem, and this factor is often not the most important task. The aim, considering the end results, must be to so fit the individual that he may take his place in his social and industrial world, and be able to apply his powers and his knowledge with the same degree of efficiency as does the average individual of his own social and intellectual class and in the community at large." It is his opinion that we should eliminate as far as possible institutional life during the impressionable years and avoid attempting to educate handicapped children above the status to which they must eventually return.

Speakers from other countries presented interesting statistical reports, their problems and methods of solution, for our consideration.

The entertainment committee left not an idle moment. They planned and worked out a most delightful program for our entertainment.

One afternoon we were driven by motor bus to Rotterdam Harbor where we went aboard a small pleasure boat and spent two enjoyable hours riding through the harbor, dodging hundreds of other small craft. Many ocean freighters from foreign ports of the world were loading and unloading their cargoes.

The trip back to the Hague from Rotterdam was most interesting and picturesque. It was supper time in Holland and all the evening activities were in evidence as we drove along the top of the dyke, the water six feet higher on one side than on the other. The cows were corralled for milking in the small plots near the red brick cottages. The entire family appeared to be out helping with the "evening chores." Every door yard was a gorgeous rose garden in a riot of colors, and every lane seemed alive with men, women, and children on bicycles.

A reception was given another afternoon by Mr. and Mrs. van den Bergh at their country place "de Wilzanck," Wassenaer. Their spacious estate with unusual formal gardens was used by the guests. Pretty blond girls from the Isle of Marken, dressed in native costumes, served refreshments; the boys in their native attire entertained us with yodelling and music.

A formal banquet was the feature the last evening of the Conference in the Palace-Hotel at Scheveningen

on the North Sea. Scheveningen is similar to Atlantic City with its endless boardwalk along the beach, attractive shops, hotels, and ar rtments for a background.

My seat at the banquet table was between a gentleman from Sweden and a physician from Utrecht. Miss B. was seated opposite, between foreigners. Not one of our companions could speak English. The gracious Swedish gentleman was eager to converse and made me understand that he had been in America as a friend of Dr. John B. Murphy and Dr. Ochner.

Toward the end of the dinner a very loud bombing was heard overhead. Every one looked around and decided that war had been proclaimed again. Some one announced fireworks over the sea. We all hurried into an empty dining room overlooking the beach, which was unlighted, and there we saw displayed the most dazzling fireworks that I have ever witnessed. Large structures had been erected previously with the charges so placed that after one was lighted it ignited the others until the whole frame was a mass of shooting stars and color, with the North Sea in the background.

The last display spelled in letters of flame, "Second World Conference for Crippled Children."

Between the wines and the many courses the delegates from the various countries responded to the chairman in appreciation of the success of the conference.

In concluding, I should like to say that we all felt this a success and hoped that another step had been accomplished to promote the welfare of handicapped children all over the world.

We are indeed grateful to the men and women who put so much time and thought into making this event so worth while. I am sure that we shall look forward to the Third World Conference with the greatest interest.

Demonstrations

Reprinted from the Special Congress number of the Journal of the Chartered Society of Massage and Medical Gymnastics

I—Massage in Post-Natal Conditions

By M. Randell, C.S.M.M.G., S.R.N., C.M.B.

Abdominal Massage

This is usually allowed by the seventh day, though some physicians prescribe it earlier. Care must be taken to see that the patient's bladder is emptied before beginning. Massage movements, consisting of lumbar side stroking, lumbar side kneading and transverse lift stroking with squeezing and general kneading of the abdominal contents, avoiding antero-posterior pressure, are suitable manipulations, followed by lumbar side vibration shakings.

If required, vibrations may be given to stimulate uterine contraction, but care must be taken in finding the height of the fundus by feeling well above the probable level and then vibrating above and behind. If involution is proceeding normally, the uterine fundus will be about the level of the symphysis pubis by the tenth day.

Massage is followed by deep breathing, paying particular attention to contraction of the abdominal muscles. The patient is encouraged to breathe out fully, and the masseuse keeps her hand on the contracting abdominal wall in order to feel that the maximum shortening is being obtained; relaxation occurs with breathing in, which the patient performs without any specific instructions, emphasis being placed on breathing out each time.

Massage of the lumbar region forms an important part of this treatment. The patient lies on her side in the earlier stages, and face downwards when she is allowed to move about in bed. The massage is given more deeply in this region, and during the third week, hacking, pounding and general nerve pressures, etc., are added.

In this position the patient is taught to contract her hip extensors strongly, then the adductors, the muscles of the pelvic floor, knee extensors, plantar flexors and invertors, preparatory to getting out of bed; also exercises on all fours, or in the knee-elbow position, contracting the abdominal and pelvic floor muscles and rounding the back in the lumbar region.

Precautions necessary are:

That the lochia are of the normal amount.

That no movements of the legs in abduction or flexion are given if there has been any tearing of the soft parts.

That exercises are omitted if the patient is not sleeping well, and massage substituted. Also, if the patient has had undue hemorrhage, massage, if prescribed, should be gentle and sedative in character, the patient being kept as quiet as possible.

Exercises when allowed should be such as are used in general debility, progressing gradually and carefully.

Massage and exercises are suspended if there is a rise of temperature and pulse rate in the puerperium, and also if the patient complains of feeling unwell, as these indicate some abnormal condition.

Particular attention must be paid by the masseuse to prevent sepsis, and those who are accustomed to treat patients early in the puerperium would be well advised to read the rules given to midwives by the Central Midwives' Board on the care of patients.

II—Breast Massage

On the third day following delivery, the breasts become very active in secreting milk, and occasionally the milk ducts become blocked, preventing the free flow through the nipple. The breasts are swollen and hard, and cause much discomfort to the patient. Relief is immediately obtained by bathing them in very hot water for eight to ten minutes. The patient lies on her side, the bedclothes protected by mackintoshes, and warmed bath towels are arranged to cover the patient's shoulders and arms.

Flat marine sponges are best to use because they can be moulded to fit the parts being treated and they hold the water. Thick flannel is also quite suitable. (An enamel receiver placed below the breast will catch drips of water.)

After the sponging, massage with a good soap and warm olive oil will be found most comforting to the patient, both hands being used, and the gland should be well supported and gently manipulated from the periphery to the centre. When the tension is somewhat diminished, hard nodules, which are the obstructed milk ducts, are dealt with by applying friction kneadings with the thumbs. Another application of water, soap, and oil follows, sufficient to form a thick layer, and then a cuping glass used, the bulb of which is squeezed and the glass laid on the periphery of the gland: this brings up the part beneath into the glass, which is then stroked round in circles, approaching the nipple slowly. A strong suction takes place which helps in emptying the blocked ducts, and the milk begins to flow more quickly. The treatment is given once or twice a day for two or three days until the engorgement subsides.

Breast massage, when milk is deficient, differs from the above in that the so-called contrast bathing is stimulating to milk production. The bathing is done with alternate very hot and very cold water for two to three minutes, followed by brisk though gentle massage, and should include vibrations and gentle shaking movements.

The patient should be treated on general lines as well, exercises and deep breathing being all important in this condition.

II—Faradism

By J. B. Mennell, M.D.

If there is one thing to which I object more than anything else, it is to lead any one to imagine that I wish to pose in any way as an electrical expert. However, I do deal with Physical Treatment as a whole, and I notice that there is a growing tendency to regard faradism merely as a form of giving exercises, and to employ it, often inefficiently, for that one form of physical treatment. It has fallen to my lot to prescribe and use faradism freely, but when it comes to asking other people to use it for me there seems to be a great deal of confusion of thought in the interpretation of the instructions.

Unfortunately there has been, and still is, a feeling amongst our profession that the only use of faradism is as a means of making a muscle contract. Let us realize at the outset that there are other uses for it. Sometimes these uses are prescribed, and I am not quite clear to what extent there is an understanding of faradism for a purpose other than for giving muscle exercise.

One of the ways in which it is of most service is when it is administered so weakly as to produce no contraction at all. There are two occasions when this method may definitely be of service. The first is when a patient has some obscure pain, such as in the back, in the gluteal region, or in the neighborhood of the hip joint. The patient merely complains of pain; let us suppose it is due to arthritis of the hip joint. Is there nothing to be done? Is it not possible that something besides the actual joint change may be the cause of some of the pain? Let us test the cutaneous sensation with a faradic current. It does not matter where the neutral electrode is applied. Then feel round generally with the labile electrode over another neutral part and ask the patient if he can feel any tingling. Gradually increase the strength of the current until you get the answer "Yes." Then move away the core in the secondary until the answer "No" is given. Then say "Tell me when you feel it," and again the current is increased until the answer "I can feel it now" is received. The labile electrode is then applied to the skin all around the region of the hip joint. The button electrode can be used direct, or an electrode can be clasped in one hand while one finger of the other hand tests any place where the skin is hyper-sensitive. Having found a spot, mark it in with a red-ink pen. Then start to approach the same place from different points of the compass, gradually approaching the point already discovered, and place a new mark when the area is again found. So we mark off an area where the skin is definitely sensitive to faradism. Treat this area with a re-action dose of ultra-violet light, and even in patients with osteoarthritis of the hip (I merely chose this as an example, as it is not a condition one would expect to benefit by this means) you may find that you can bring an element of relief unobtainable in any other way.

The second occasion is when dealing with an injury such as tennis elbow, with pain over the inner side of the arm. Stroke over the area with a moistened finger as before, and presently the patient will say "There it is." Having found one area of sensibility we must endeavour to define one pin-point of sensitiveness, and for this a small metal-pointed electrode is required. As a means of diagnosis, and as a guide to suitable treatment, use the current with a strength that can only just be felt over the ordinary surface of the skin. If one minute spot can be picked out in this way, it means that the case is suitable for the use of the galvanic needle.

The use of faradism for its sedative effect is often neglected. For this purpose put one pad above and one below a sensitive area and run the current through until you can just see the muscle contact. Then withdraw the core slightly. The "anaesthetic" effect, as Lucas-Championnière called it, is definitely of service, and can be used when treating any joint. Occasionally it will be beneficial for reasons unknown, and it can play a large part in relieving actual bone pain.

I remember one case of advanced Paget's disease where the tibia had been guttered twice, and once, in addition, the bone had been sawn right through above and below the guttered area. All was unavailing. The patient was kept going, and was able to lead an active life, by means of faradism. This was before we knew the curative effect of ultra-violet light for Paget's disease. All we did was to place one pad over the upper end of the tibia, and one over the lower end, and run a faradic current between the two of so low a strength that no muscle contraction was produced.

Next we come to the use of what might be called a "sub-maximal" current. This is pre-eminently of service in teaching relaxation. Some patients cannot relax, and the simplest way to teach them to do so is to make the muscles contract first.

Then comes a great problem, the treatment of spastic paralysis. Here faradism can be used, but only as a means of teaching the tightened muscles to relax, not to contract. Then there are certain conditions where we want muscle movement, not muscle contraction in the sense in which we have come to use the word. You are all familiar with the difficulty of bending the knee after a fracture of the femur. Faradism, used intelligently, can help materially. The slightest degree of muscle movement will be sufficient to prevent the muscle from adhering to the bone at the site of the fracture. The same thing applies to a sutured tendon in the arm. A movement can be secured with the faradic current, but it must not be one of sufficient amplitude to move the fingers. The lightest possible touch, merely a muscle movement, not worthy of the name of contraction, is sufficient to prevent the tendons from adhering to the sheath.

You all know the difficulty of teaching patients to contract one muscle independently. You cannot teach a patient how to contract any individual muscle without showing how it is done; it is largely a question of educating muscle sense when that sense has been lost. Suppose the patient has synovitis of the knee with great swelling and muscle incapable of contraction; a mere flicker of movement in response to faradism is one of the most valuable things in re-education. Two minutes of education with a faradic current is often sufficient to accomplish what could not be done in any other way in two hours.

After recent injury and recent muscle tears the chief thing to guard against is the formation of adhesions. This can be done by using the current to produce the minutest movement around the site of the injury. Start by applying the current away from the injured area, and gradually approach it until actually over it. The faintest overuse of the current, however, will increase the tear and do infinitely more harm than good.

When it comes to the question of chronic swelling in the legs a mechanical vibrator should first be used, and then one electrode is placed over the thigh and another round the ankle. Then bandage the foot and the whole leg with an elastic bandage as tightly as is possible without discomfort. The current is then passed between the two electrodes and the muscles contract and relax, thus pumping, as it were, the venous blood and the lymph along their respective channels under the pressure of reinforced elasticity of the skin.

Certain muscles, although composed of voluntary muscle fibres, will only move as part of a general co-ordination, *e.g.* the foot muscles, and it is always much easier to re-educate the muscles of the hand than of the foot. Hence it follows that the re-education of the muscles of the foot is much more easily accomplished if faradism is used than if we rely on voluntary effort for this purpose.

The faradic current can also be used for giving exercise, and here care should be taken to see that each contraction is as full as possible. To exercise some particular group of fibres in one muscle mass, *e.g.* the quadriceps, place the neutral electrode in any convenient and suitable position. Then, with the labile electrode, test various spots over the areas you wish to stimulate until you have found the exact spot at which the muscle responds best to the stimulus. Having found this spot, keep the electrode over it while giving the treatment. Allow complete relaxation between each contraction. The patient may take the current from the first layer with comfort, but a full contraction by sliding in the core to the fullest extent, when a second layer is employed, may prove too much. If so, push in the core till the full contraction seems to have been secured, and then you can give a kind of "extra jab" at the end so as to be sure the maximum has been reached. Unless you give all the patient can stand you are not treating him to the best advantage. A stronger current can be tolerated as treatment proceeds, so the degree of strength should be increased by imperceptible stages, but always progressively. We must aim to secure an ever-increasing amount of exercise (by using a corresponding increase of current) not only during any individual treatment, but also from day to day.

Faradism may be used to stretch scar-tissue. In this instance, begin to secure the contraction with the muscle in relaxation, so far as the points of origin and insertion will allow. Then the joint is moved so as to separate these two points by slow stages, thus increasing the tension on the muscle. For instance, if you wish to stretch scar-tissue in the calf muscles, the stimulation should start with the knee flexed and the ankle plantar-flexed, and should continue until the knee is straight and the ankle fully dorsi-flexed. This position should be maintained as well as possible while the muscle is made to contract to the fullest extent. The best way of offering the resistance is to place the patient's foot against the sternum of the operator, who then leans his full weight against the sole of the foot, so as to oppose the strength of the contraction with the full weight of his body. When the contraction is painless under these conditions, the patient may be considered as cured—not before.

It is difficult to deal with a large subject like this in half an hour, but I hope I have succeeded in giving you something to think about. If you are administering faradism, do so as intelligently as you would any other form of treatment.

III—Ante-Natal and Post-Natal Exercises

By Margaret Morris, C.S.M.M.G.

The object of the exercises we are going to show is to try to give exercise to all the muscles of the body without strain or fatigue, and try to keep up the muscle tone in spite of the inevitable stretching. All these exercises I am about to show have actually been given to patients in this hospital; they have been found quite suitable for selected patients, and have been carried on until the third or fourth day before the birth of the child. The exercises are then continued on the fifth or seventh day after the birth, with the permission of the doctor. Of course, I am speaking here of normal cases.

The idea is to start the exercises, if possible about the fourth or fifth month of sequency, so that a number of exercises can be taught that can be done later on as post-natal exercises. It is important that most of the ante-natal exercises should be performed in sitting position, to prevent fatigue from standing too long, as these patients so often do. All the exercises are modified or progressed to suit each individual, according to whether the patient is weak or strong.

I have evolved these exercises in collaboration with Miss Randell, whose experience in maternity work has made her co-operation so valuable.

First of all we will show a few early ante-natal exercises; these always include exercises for flat-feet and for posture. Women in pregnancy tend to walk with an arched back. All exercises are done combined with breathing exercises. Greek positions are used because these are so valuable for the oblique abdominal muscles.

Exercises without weight-bearing are taught early and can be continued up to the end. They include all the joint movements, and are also very good mental exercise. Some are done sitting, others in lying position.

Post-Natal Exercises.—The patient upon whom we are demonstrating some of these post-natal exercises had her baby six days ago. She has so far had only one lesson since, and I think you will agree she has done quite well.

In early post-natal work the patient is first taught to contract the glutei and the quadriceps and to invert the feet on expiration, while relaxing on inspiration. Abdominal contractions are then taught with pressing back of the lumbar spines, the patient in crook lying; then gentle pelvic movements are given, slightly tilting up the pelvis while inverting the sphincters and drawing up the pelvic floor. Afterwards exercises for the various abdominal muscles are given, including rotation of the pelvis. Progression is gradually made to stronger exercises, together with exercises for the head and shoulders, arms and legs.

Dr. Wyatt thought that special attention should be paid to the recti muscles, and at his suggestion this series of exercises in careful progression was planned.

Where there is difficulty in obtaining milk, special arm exercises for alternately stretching and compressing the vessels are given, accompanied with deep breathing, as well as the general exercises.

In these movements I believe in emphasising the artistic side—everything that leads to good posture should be specially stressed. It is most encouraging for the patient to feel the return of muscular efficiency, poise, and general well-being.

Paralysis in Children

By R. G. Gordon, M.D., D.Sc., F.R.C.P.E., Physician to the Bath, Somerset, and Wiltshire Orthopaedic Hospital

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The occurrence of paralysis in children is relatively common, but there is a good deal of confusion in the minds of many people about their nature and the possibilities of treatment. The subject is a large and difficult one and is complicated by many considerations, nor is the literature very helpful since it is scattered and frequently contradictory. So far as treatment is concerned, by far the most important factor is whether the child is mentally defective or not, since in every form of paralysis it is necessary to have the full co-operation of the child if any real progress is to be made. Treatment must take the form of physiotherapy and re-education since operative procedures, however theoretically admirable, can only be really useful as a late and possibly last resort since every competent orthopaedist will agree that operations which interfere with muscle, bone, or nerve during the child's period of maximum growth are only to be undertaken with great caution.

The only way to deal with the subject in a short article is to tabulate the possibilities with which we may meet, and discuss each.

First as to causes—these may be:

(1) Pre-natal. (*a*) Failure of part of the nervous system to develop properly (non-progressive); (*b*) Some inter-uterine inflammatory or degenerative process, the nature of which is not at present understood (usually non-progressive, rarely progressive).

(2) Natal. Injury during the process of birth (*a*) from tearing (non-progressive); (*b*) as a result of haemorrhage (non-progressive).

(3) Post-natal. Infections (usually non-progressive once the acute stage has passed off).

We see, therefore, that in most cases, at any rate, of the more common forms of paralysis, the condition is non-progressive, and that, therefore, any change is likely to be in the direction of improvement.

Exceptions to this rule are rare and need not be fully discussed here. Examples are: (1) Certain progressive paralyses which are relatively rare. Progressive lenticular degeneration; very rarely amyotrophic lateral sclerosis occurs in childhood and is progressive. (2) Relapses in certain infective conditions, such as acute poliomyelitis (but the relapses usually recover) and (more serious when they occur) in encephalitis lethargica. (3) In cases of severe injury to the spinal cord where the more or less isolated cord has recovered certain automatic reflexes these may regress again usually as a result of sepsis. These cases are not important since the function has never been of any real use. (4) In certain of the muscular dystrophies, *e.g.* pseudo-hypertrophic muscular paralysis, which are not true paralyses at all.

The next important question is where in the nervous system do these various factors show their influence. The parts we may consider are:

(1) Cortex (*a*) as a whole; (*b*) motor tract.
(2) Basal ganglia and mid-brain.
(3) Cerebellum.
(4) Spinal cord in complete section.
(5) Lateral columns of spinal cord.
(6) Anterior horn cells.
(7) Peripheral nerves.

Let us consider these in relation to our three previous headings:

(A) Congenital leisions, *i.e.* failure of development or intra-uterine disease, the distinction between which is difficult and of no great clinical importance.
(B) Injury.
(C) Infection.

Congenital Affections

(1) *Cortex.*—(*a*) If the congenital affection is extensive, then there will be a general mental deficiency which may or may not be accompanied by motor disabilities. In this case any treatment of the paralysis is likely to be very disappointing, since the child is more or less incapable of co-operation.

(*b*) If the motor tract, *i.e.* the pyramidal system, is principally involved, we have a condition of cerebral diplegia or Little's disease. This results in a weakness and rigidity of all four limbs, the legs being worse than the arms. This is often associated with athetotic movements—typical squirming, slow, entirely involuntary movements most noticeable in limbs, lips and tongue, probably due to involvement of the caudate nucleus and putamen, which prevents their normal control of the globus pallidus. These children are often much more intelligent than they seem. They are, however, often classed as defectives principally because they cannot express themselves easily either by speech or writing. Much, however, can be done for the more intelligent of these cases by careful and patient training. If they suffer from athetosis, their writing will never be any good because of the difficulty they experience in controlling the pen or pencil, but they can learn to type since

they can hit the key of the typewriter in between the involuntary excursions of their fingers. In one favourable example of a severe diplegic the patient was able to swim a short distance on her back and to ride a horse quietly.

(2) *Basal Ganglia and Mid-Brain.*—There is a type of child, not so uncommon as is sometimes supposed, which has been described as a "frog baby," since the limbs are held abducted and flexed rather in the position of the squatting frog. They are characterized by a "lead pipe" rigidity reminiscent of the rigidity of Parkinson's disease. The reflexes are normal and the muscles on excision show no pathological changes. It is suggested that these cases represent a congenital affection of the corpus striatum or its cortical connections. Treatment is slow but on the whole reasonably successful in producing improvement both in posture and movement.

(3) *Cerebellum.*—Congenital affections of the cerebellum are relatively common and result in a reeling ataxia with hypotonia of the muscles, with special difficulty in maintaining the balance of the trunk on the pelvis and the limbs. There is often nystagmus and dysmetria, that is, difficulty in estimating the distance of an object in reaching for it with the limbs. Treatment by re-education often produces marked improvement by enabling the cortex to correct the ataxia which results from interference with cerebellar control. This is achieved principally by means of visual fixation; but, later, re-education may be continued with the eyes closed, making use of direct reception of muscle and joint sense by the cortex.

(4) *Spinal Cord.*—When the lateral columns of the cord are affected, we find the condition known as Friedreich's ataxia, which is probably congenital, although it may be comparatively late in its appearance. The gait is similar to that of cerebellar affections, and to certain muscular atonias. The diagnostic signs are the characteristic claw-foot and absence of tendon jerks, while slight involvement of the neighboring pyramidal tracts results in an extensor plantar reflex. Nsytagmus is almost always present, and stuttering is frequent. Treatment may do something by re-education but tends to be rather disappointing, and these cases do not survive through adolescence.

INJURY

Injuries are caused to the brain either by severe compression of the head in passage through the birth canal or by the application of forceps. In the vast majority of cases the result is haemorrhage, which will cause laceration or pressure on the nervous tissues. As a matter of fact, however, recent work has shown that many cases of cerebral haemorrhage at birth are so severe as to be fatal either immediately or in the course of the first few weeks of life, or insufficiently severe to cause marked permanent effects, so that there can be no doubt that the importance of haemorrhage as an etiological factor in the paralysis of children has been exaggerated.

Injury to the spinal cord and peripheral nerves is in the majority of cases due to direct tearing in the course of delivery of transverse or breach presentations, in which excessive traction is brought to bear so as to place intolerable strain on the delicate and friable nervous structures.

(1) *Cortex.*—(*a*) Injuries sufficiently severe as to injure the cortex as a whole and result in amentia, and in which the infant survives, must be very rare and need not concern us here.

(*b*) Injuries to the motor tract, on the other hand, are quite common. It is possible in cases where the flax is torn by over-riding of the parietal bones, for the haemorrhage from the longitudinal sinus to be symmetrical and involve both motor leg areas or even leg and arm areas. In such cases the resemblance to cerebral diplegia may be very close, but in almost all cases of what should be called double hemiplegia, one side is more affected than the other, and this serves to distinguish one group from the other. Further, as has been seen in the case of diplegia, the legs are worse than the arms, but in double hemiplegia the arms are worse than the legs.

Ordinary hemiplegia affecting one side or other of the body is fairly common as a result of difficult labour, especially if this involves instrumental interference. Whether the hemiplegia is single or double, there will be found weakness and "clasp-knife" rigidity with increase of the tendon reflexes, abolition of the abdominal reflexes, entensor plantar response and clonus. There may or may not be a certain amount of amentia, which will, of course, tend to be more pronounced the greater the area of cortex which is destroyed. In those cases whose motor area is not well controlled by the higher cortical centres, that is, in the potential epileptics, the still further destruction of controlling fibres and cells as a result of the injury may precipitate epileptic convulsions. Treatment of these cases will be along the lines of re-education in relaxation of rigidity, and use of the weakened limb will depend for its success on the extent of the injury and the care and persistence with which the remedial exercises are carried out. Such treatment may have to be continued over years until the maximum improvement has been attained and it becomes possible for the orthopaedist to step in to the best advantage with permanent appliances or operations.

(2) *Basal Ganglia and Mid-Brain.*—Injuries to the basal ganglia from rupture of branches of the middle cerebral have been reported, and may account for some cases of "congenital" athetosis and chorea, but it is difficult to be certain that these are not cases of arrested development or degenerative changes in utero.

(4) *Spinal Cord (complete section).*—Complete transection of the spinal cord is a serious injury which may occur from severe traction on the spine in breach cases. Such traumata above the fourth cervical segment are incompatible with life, since all respiratory muscles are paralysed, including the diaphragm. Below this level, however, the patient may survive, and after the first shock has passed off will present the picture of complete paralysis and anaesthesia below the lesion, with loss of voluntary control of bladder and rectum. The latter may, however, come to act automatically, that is to say, they will void themselves only when the pressure of their contents has reached a certain level. The isolated cord may also show certain reflex responses which may be very misleading and give rise to false hopes and expectations, especially in the minds of parents. When the leg or foot is pinched or pricked it will be drawn up sharply, and, as Head and Riddoch showed, this reaction is often accompanied by sweating and voiding of the bladder, the whole complex reaction being called a mass reflex. In course of time, especially in the presence of sepsis, these reflexes may disappear owing to the phenomenon described by Sherrington as the dystrophy of isolation, for the human cord does not easily tolerate dissociation from the higher controlling centres.

If the lesion is not too high and bed sores and infection of the bladder can be avoided—no easy task—something may be done by orthopaedic appliances to let the patient get about on crutches, but the anaesthetic dystrophic skin does not tolerate such appliances well.

(6) *Anterior Horn Cells.*—When traction is applied to one or more limbs during delivery, the force used may be sufficiently great to exert such strain on the cords of

Type of Lesion	Region of Nervous System affected	"Disease"	Intelligence	Prospects of Treatment
CONGENITAL AFFECTIONS	Cortex as a whole	Amentia	M.D.	Very poor
	Motor tract	Congenital Diplegia (Little's disease)	? M.D.	Very fair
	Basal ganglia and Mid-Brain	? "Frog baby"	—	—
	Cerebellum	Family Ataxia	Fair, often "queer"	Good
	Spinal cord in complete section	—	—	—
	Spinal cord, lateral columns	Friedreich's Ataxy	Good	Poor
	Anterior horn cells	—	—	—
	Peripheral nerves	—	—	—
INJURY	Cortex as a whole (haemorrhage)	Amentia Epilepsy	M.D.	Very Bad
	Motor Tract (haemorrhage)	Hemiplegia, single or double. ? Paraplegia	? M.D.	Poor, unless slight cases
	Basal ganglia. Mid-Brain (haemorrhage)	? Some cases of congenital chorea and athetosis	Normal	Fair
	Cerebellum	—	—	—
	Spinal cord in complete section (tearing)	Paraplegia	Normal	None, if complete
	Spinal cord, lateral columns	—	—	—
	Anterior Horn cells (avulsion)	Mono- or diplegias	Normal	Bad
	Peripheral Nerves (tearing)	Monoplegia	Normal	Poor, if all cords of plexus involved. Fair, if lesion less extensive
INFECTION	Cortex as a whole	Encephalitis. Parkinsonianism	Personality changes	Poor
	Motor tract	Polio-encephalitis	? Normal	Fair
	Basal ganglia and Mid-Brain	Encephalitis	? Personality changes	Poor
		Progressive Lenticular Degeneration	—	None
	Cerebellum	—	—	—
	Spinal cord in complete section	Myelitis	Normal	None, if complete
	Spinal Cord, Lateral Columns	—	—	—
	Anterior horn cells	Acute Poliomyelitis	Normal	Poor to good, according to severity.
	Peripheral nerves	Neuritis (post-diphtheritic general poly-neuritis, &c)	Normal	Good

the great plexuses that their cells of origin in the anterior horn are actually avulsed, and, of course, completely destroyed. This will naturally result in a complete flaccid paralysis of the involved limb and no treatment can hope to restore movement to the muscles supplied by the axons of these cells, the only hope being to outwit the disability by some orthopaedic appliance.

(7) *Peripheral Nerves.*—Similar manipulations of a less severe nature result in the tearing of one or more of the cords. This is commonest when the arm is pulled upon and results in what is known as an Erb's paralysis. The prospects here are much better, for the lesion is less extensive and the resulting paralysis and anaesthesia will, of course, depend on the actual cords affected. If there is not too much scarring, regeneration of nerves is possible, since their cells of origin are intact; and operation to remove scar tissue and, where possible, to rejoin severed trunks has a distinct place, while physiotherapy in the form of massage and re-education and electricity, when it can be tolerated, often brings about results much beyond primary expectations.

INFECTIONS

Infections are for the most part post-natal, though syphilis is an important exception to this. Since congenital syphilis tends to prematurity, its influence is complex, but inasmuch as most of the direct manifestations of the disease appear after birth, it is convenient to consider it with the genuinely post-natal infections. These may attack the linings or meninges of the brain and cord, but unless there is involvement of the structure of the nervous system itself in the form of an encephalitis or myelitis, the result is either death or recovery without residua.

(1) *Cortex.*—Where the cortex as a whole is concerned we are dealing with an encephalitis, a condition very frequently fatal, but as exemplified by encephalitis lethargica as it affects children, it may result in personality changes which may lead to chronic mischievousness and delinquency. When the motor cortex is involved we may have a single or double hemiplegia, which is only distinguishable from the case of injury by the history, a feature not easily obtained with accuracy either from parents or even medical men.

(2) *Basal Ganglia and Mid-Brain.*—The basal ganglia are affected by encephalitis lethargica and in progressive lenticular degeneration or Wilson's disease, the pathology of which is by no means clear, but is probably toxic. This results in Parkinsonian rigidity and considerable restriction of movement with or without tremor. Treatment is not satisfactory, as the extra pyramidal lesions are not so easily corrected by re-education as are those of the pyramidal tract.

(5) *Spinal Cord.*—Complete lesions of the spinal cord are often due to syphilis, and may resemble the corresponding lesions due to injury. Sometimes vigorous anti-specific treatment is useful, especially if the lesion is due to vascular involvement leading to a starvation of the nervous tissues rather than to a direct infection of the latter.

(6) *Anterior Horn Cells.*—By far the commonest in-

fection of the nervous system in children is, of course, acute poliomyelitis, the incidence of which is mainly on the anterior horn cells, and the extent and disabling effect of which varies so enormously. It is impossible to give a full exposition of the symptomatology and treatment of this condition here, but it may be permissible to lay stress on the enormous importance of initial rest. All cases except the most trivial should be nursed on a Jones's frame for two months from the date of the initial symptoms, and when physiotherapy is started, great care must be taken that progress is obtained, for many muscles lose the little power they possess as a result of too early and too vigorous treatment.

(7) *Peripheral Neuritis.*—Peripheral neuritis in children is most commonly due to diphtheria, in which case there is as a rule a clear history of sore throat, and often of the discovery of the Klebs-Loeffler bacillus. It may occur a few days or several weeks after the throat lesion, and usually affects the soft palate first. The motor nerves of the eye, the vagus, and phrenic are susceptible, but sometimes all the limbs are paralysed with loss of reflexes and sensory changes. Recovery is as a rule assured in the long run, though it may require persistent and prolonged treatment, and in view of vagal involvement and the possibility of cardiac failure, initial rest is most important. Cases of general poly-neuritis, probably of streptococcal origin, are met with, as are those following typhoid and other infections.

TREATMENT

As to treatment of these conditions in general, perseverance, patience, and discrimination are essential. Physiotherapy and re-education are the chief agencies, for as has been said above, operative procedures must not be lightly undertaken when the tissues are actively growing. Care must be taken in spastic and rigid cases not to increase the rigidity by injudicious stimuli in the form of massage and electricity, and it must be remembered that young children are often hurt and frightened by the application of electricity in any form, and the loss of the confidence and co-operation of the patient far outweighs any benefit derived from the current. All forms of re-education are helped enormously if they can be carried out in hot water in the form of a large hot pool bath, for in this medium the effects of gravity are overcome, rigid muscles are relaxed, contractions can more easily be reduced and pain is diminished.

Finally, it is recognised that the proper diagnosis and treatment of these conditions are a difficult and delicate art, in which even the most expert are frequently at a loss. It is hoped that the accompanying tabular arrangement may do something to simplify the problem.

Physiotherapy of Low Back Strain

By Edward T. Evans, M.D., Minneapolis, Minn.

Lumbosacral pain is a reflex due to irritative factors, traumatic or infectious. Trauma may be insidious as in poor posture or acute as result of recent injury and its residuals.

An understanding of the fundamental anatomical and physiological factors concerned is necessary for the rational restoration of function in the lumbosacroiliac area.

POSTURE

Posture, faulty in type, is one of the common causes of backache. Goldthwaite of Boston was one of the first in America to strongly stress this factor, and his ideas, although perhaps too inclusive for some, remain the criteria of diagnosis and treatment. A few diagrams will perhaps illustrate salient points. (Slide 8.)

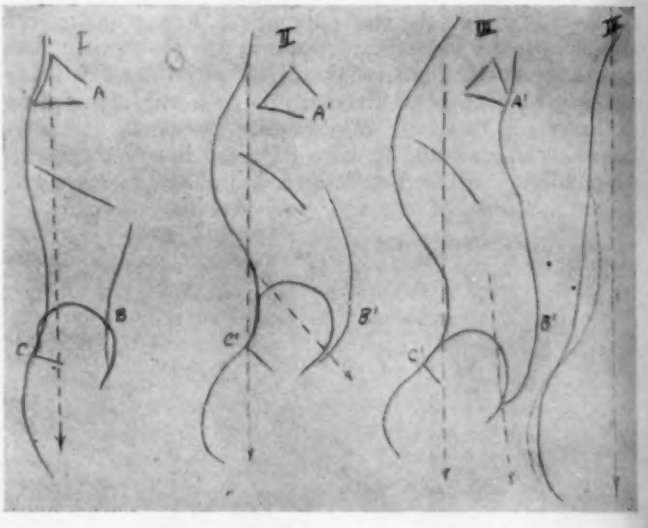
Pain is a reflex due to irritative factors, traumatic or infectious. In the case of poor posture it is almost invariably a result of muscular strain. In the well-balanced type (figure 1) I would call your attention to the contour of the spine, every segment lying well supported on the next lower segment. (A) indicates the position of the scapulae, held well back by intrascapular muscles of proper tone. The inclination of the ribs is normal, supported by the accessory muscles of respiration and skeletal posture. (B) indicates the good abdominal muscle tone, and (C) the normal lordotic curve of the lumbar vertebrae with a well-balanced lumbosacral articulation. At all points the centre of gravity (dotted line) is well-supported in balance. Figures 2 and 3 represent the deviations from normal commonly met with. Note the lowered, forward-lying scapulae with stretched-out intrascapular muscles, and shortened pectoral groups. Note the abdominal wall, a "pot belly," and the increased lordotic curve with the poorly-balanced lumbosacral articulation. Imagine if you will, the multitude of painful stimuli originating at these various sites and you have the symptoms of backache. But that is not all,—a vicious circle has started, the sufferer is constantly tired, has lowered reserve and lessened muscle tone, and the underlying condition is aggravated. Figure 4 represents poor posture in a chair or if horizontal in a sagging bed. The complaint is not only lumbar but also cervico-dorsal strain.

TREATMENT: Treatment lies not necessarily in change of posture but certainly in increase of muscle tone and relief as far as possible from aggravated faulty strains on muscles and ligaments of the component parts of the spine, by exercise, release from mental and physical fatigue, and properly fitted supports when indicated.

The exercises should be simple so that they can be pursued at home as well as in the class room.

Three essential procedures are carried out—

A. In the morning before arising and at night on



retiring, the patient lies flat on his back and slowly lifts and lets fall from the hips, the extended legs, vertically upwards, then obliquely upwards to right and left. Both limbs should be elevated and let fall simultaneously under muscular control. This utilizes and strengthens the rectus abdominalis, the internal and external obliques, the iliopsoas, and the lumbar muscle groups, increasing their tone.

B. On arising and just before retiring, the patient, standing erect, circumducts the arms in a direction of forward elevation from the sides and at the end of the arc forcefully abducts the arms and contracts the intrascapular groups. This increases the tone of trapezii and intrascapular muscles, stretches the pectorals and improves shoulder girdle tone and carriage in addition to assisting the chest development.

C. Whenever opportunity affords the patient stands with his feet about 4 inches from a baseboard with buttocks against the wall, shoulders well back, and head erect. So standing, active contraction of the abdominal muscles with flattening of the lumbar spine against the wall is carried out. He then walks away from the wall, holding this position (the ideal of erect posture). This simple act teaches good posture and, frequently repeated, results in improved postural habits.

Early in the treatment the use of heat and massage, locally, to relieve spasm and the use of supports may be necessary.

THE INDUSTRIAL BACK

In presenting this phase of my paper it is necessary, for clarity, to speak briefly of arthritis. From the multitude of types described two main types are evident, hypertrophic and atrophic, representing bone and joint

reactions to infection or toxaemia. A consideration of these types is not essential to the present discussion but I wish to briefly point out that these are end-result entities and in the early stages, especially in the spine, are often unrecognizable so that the occurrence of a painful back in the absence of demonstrable arthritis does not preclude arthritis, especially that type of plastic arthritis commonly ascribed to infectious origin and attacking the transverse articulations. The evidence of a careful history and general physical examination is a more reliable criterion at this early stage. Conversely, the presence of true arthritic changes does not argue against an "industrial back" but careful evaluation of the degree and relationship of pre-existing arthritis to the injury is necessary from a legal as well as a therapeutic standpoint.

If we strip the skin and superficial fascia off the back and with an x-Ray eye consider the underlying structures we are amazed at the innumerable short muscle fibres, overlying, intertwining and criss-crossing from ilium to process, process to spine, here, there and everywhere,—literally thousands of them. And further, ligaments of almost equal number, capsules and synovia of transverse articulations, fascial expansions, dural prolongations along nerve roots, and then the comparatively simple and sturdy vertebrae under all, and yet most intimately a part of the whole. And nearby the sacroiliac joints, simpler and infinitely sturdier than any of the other joints.

Let me digress for a moment at this point. I believe there is such a thing as sacroiliac subluxation or at least subluxation somewhere in the lumbosacroiliac region. I do not believe it is as frequent as stated by some. I recall two positive roentgenograms of rotary subluxation, one of which ossified completely and the other was relieved by manipulation. I have several cases who were relieved by manipulation, whose x-Rays were negative and I cannot convince myself that these were subluxations. Rather I guess that they were snapping ligaments, taut muscle fibres or pinched tissues relieved by manipulation. I recognize the possibility but not the probability. For its diagnosis I require the following criteria.

1. Previously negative history for arthritis or subacute infection substantiated by negative findings on general examination.
2. Sudden onset.
3. Excruciating, persistent localized pain.
4. Radiation, if any, down sciatic nerve. (Not lateral or anterior femoral cutaneous as these arise high in the lumbar plexus.)
5. Relief, at least transient, by manipulation.
6. Recurrence as above.
7. Positive Gaenseln sign (Lovett, Goldthwaite, and Laerrec, signs may be misleading).

Anomalies of the bone may be seen, especially in the lumbosacral region, and as such must be properly considered and their relation to the subject evaluated. But what should impress one most in such a mental dissection is not sturdy bone but rather soft tissue, and this must be considered primarily in the diagnosis and treatment of these conditions. In the absence of positive clinical evidence of arthritis, or the x-Ray evidence of causative anomaly or injury to bone structure, the condition usually resolves itself into one of soft tissue injury.

TREATMENT: The treatment is that of all periarticular injury,—Early rest and support with, in a few days, depending on the extent of injury and the patient's athletic development, the restoration of function. This I stress,—restoration of function by heat, massage, and exercise. The prolonged splinting of these backs by rest, strapping or braces is detrimental to good results, an economic waste, and conducive to making confirmed invalids, too often called malingerers though the fault lies with the profession.

These injured backs are susceptible to arthritis, so every possible focus of infection should be searched and treated, especially the bowels and prostate.

In case the back has continued beyond the acute stage and mobilization is proceeding too slowly, the forceful manipulation of the back in all directions will mobilize it and reproduce the original injury, from which point proper treatment can be instituted. In these cases, especially the old chronic rigid types, always carefully rule out arthritis. Many of these backs, once injured, are peculiarly susceptible to repeated strains because of stretching of fibrosed areas not sufficiently mobilized in the early treatment.

For this reason prolongation of active local treatment into that of occupational therapy and active exercise is often wise to insure the full mobilization of these fibrosed muscles.

CONCLUSIONS: In the absence of positive x-Ray evidence of gross bony injury, the manifestations of back complaints are soft tissue injury. The restoration of function in the soft tissues should be attempted, if possible. Supporting belts or braces may be necessary as adjuncts of this treatment for relief of pain until muscular tone has been restored.

Not all cases will be relieved and the judicious estimation of failure of return of function under treatment may save many weary, expensive months of treatment. Here surgical fixation or the use of apparatus might be wise.

Volkmann's Ischemic Contracture

By Henry W. Meyerding, M.D., Section on Orthopedic Surgery, The Mayo Clinic, Rochester, Minn.

In 1869 Volkmann described an ischemic contracture of the flexor muscles of the fingers, wrist and forearm resulting from injury with permanent, partial disability and disfiguring deformity. Although the immediate recognition and treatment of such deformity would do much to improve results, many patients consult physicians months and years after injury, when contracture has resulted in secondary changes in the bone and soft tissues, such as atrophy and stiffness. The surgeon's aid, the physiotherapist, becomes of great value in carrying out the treatment in these cases, especially before and after surgical procedures have been instituted for the deformities of long standing.

Volkmann's ischemic contracture or paralysis may result from injuries which have not been treated. Therefore, all attendants should recognize the necessity of never giving an opinion as to the cause of the condition. The trauma, usually fracture, is accompanied by hemorrhage, displaced fragments of bone or dislocations producing intrinsic pressure, often torn blood vessels or nerves. The veins being thin walled are easily flattened and blocked, whereas the thicker-walled arteries permit blood to be forced into the tissues. Thus swelling and cyanosis occur accompanied by persistent and excruciating pain. The hand becomes cold, moist, and numb; this is followed by contracture of the thumb and fingers. Unless intelligent treatment is obtained in a few hours, this intrinsic pressure will suffice to produce ischemic paralysis or contracture. Accidents, such as occur in modern automobile travel and in which the patient may be found sometimes later or be carried for miles to reach a physician, may permit the time element and the pressure from within the extremity to produce the deformity. Thus the physician concerns himself in relieving the pressure which interferes with circulation by reducing the fracture or dislocation, and applying retentive appliances for immobilization. When this has been done pain should be relieved, not aggravated. The circulation of the extremity must be free and inspection and palpation of the parts during the first few days are imperative. Should hemorrhage and hematoma obviously be the cause of ischemia, surgical evacuation of the clot and ligation of the bleeding vessels under the most rigid aseptic technic are indicated. Fractures in the humerus, just above the elbow, present the proper setting and it is here that the most common cause of the contracture is found. The condyles of the humerus are torn off and the upper fragment slips forward pushing downward to crowd against vessels and nerves. Blood collects in the antecubital fossa further crowding these delicate structures. Any movement adds to the trauma and bleeding not only from the ends of bone but from the soft tissues. Flexion of the elbow without proper reduction of the fracture or flexion after swelling has occurred, increases pressure. If the elbow is badly swollen it would be far more sensible to wait until the swelling subsides before reduction of the fracture is attempted. In the meantime treatment by elevation, heat and massage would aid the absorption of edema and clots. Bardenheuer stated that 8 per cent of cases of Volkmann's contracture resulted from fractures in which no treatment was given. In a series of 128 cases which I reported in the "Journal of the American Medical Association" in February, 1930, no evidence of fracture was found in 5 per cent. The site of fracture resulting in Volkmann's contracture in this series was the humerus, mostly supracondylar, fifty-six, the radius and ulna nineteen, the radius seventeen, the radius and humerus six, the ulna three, the clavicle three, the metacarpal bone three, the tibia and fibula three and miscellaneous situations eighteen. Ninety patients were men and thirty-eight were women. One patient came for relief as early as three days after the injury, and some came as late as seventeen years; the average duration was about three years. Ages varied from three years to more than sixty years; the average age was twenty-four years. Sixty-eight per cent of the patients were aged less than thirty years and less than 30 per cent were operated on. In this group of 128 cases treatment varied and according to the patients' statements was as follows: splints in seventy cases, casts in twenty-five, bandages in ten, splints, bandage and flexion in eight, no history of treatment in eight, no splint, no fracture, no history of treatment in six, open operation and splints in three, and casts and splints in six; in four cases infection had occurred. The patients were emphatic in their description of pain, swelling, numbness and change of color and often related attempts at relief by altering treatment.

Retention casts, splints and bandages may aid in the injury by exerting external pressure even to the point of causing sloughing. Physicians and attendants must ever be on guard to the dangers of impaired circulation in the extremities, especially about the elbow. Opiates should not be required following proper reduction and application of apparatus. When the contracture is discovered early, all constriction must be removed at once and every effort made to improve circulation. If improvement does not occur and severe symptoms exist, deep incision followed by hot moist dressings may be advisable. After the deformity has been present for days or weeks, heat, massage and gradual extension by splints are preferable, as by this time clots and swelling are subsiding. Splints to extend the fingers first, then splints to extend the fingers and wrists are employed continuously, when physiotherapy is not being given. These splints are usually made to extend on the back

of the forearm, and gentle traction by means of rubber bands attached to adhesive tape on the fingers corrects the claw-like deformity. After months and years have elapsed operation is usually necessary and the functional results are correspondingly less good. Nerves must be examined, as well as blood vessels, for by freeing large nerve trunks from the scar tissue or suturing severed nerves considerable benefit is derived. The flexor tendons, on palpation and extension of the fingers and wrist, tighten like violin strings. The muscles now have lost their elasticity and become hard, cord-like masses of contracted scar tissue. Should the examiner try to force the fingers and wrist in extension, the phalanges flex and the finger nails cut into his hand. It becomes obvious that lengthening of tendons has become necessary in these late stages. This may be done readily and the fingers brought into extension with the wrist. It is then necessary, through long and skilful care by surgeon and physiotherapist, to attempt to reëstablish function.

The following treatment has been outlined by Ann Kelley of the Section on Physical Therapy of The Mayo Clinic.

Since this form of contractures may arise from pressure within or without the affected limb, it is the duty of the physiotherapist to help prevent such contractures as may arise from external pressure. Not only must she know the purpose of the splint and bandage applied, but she must accept responsibility for their care and proper adjustment. When contracture is already present, she must understand the purpose of any apparatus used and the result expected from the physiotherapeutic measures employed.

At The Mayo Clinic the best results have been obtained by combining different forms of treatment rather than by the use of any particular form. Baking, massage, warm whirlpool baths, exercises, electrical stimulation, gentle but firm stretching of contracture with proper splinting, are so many factors toward bettering the end result. Local application of heat in the form of baking, followed by massage of all the muscles involved help to produce relaxation of the tissues and increase their blood supply, thus building up muscle tonus and helping to lessen edema, pressure and pain. Additional massage over and around the scar tissue aids in loosening adhesions, and in freeing the infringed nerves and blood vessels.

Following the baking and massage, the warm whirlpool bath helps still further to relax the affected limb and to bring additional blood to the affected parts. Gentle stretching of contractures and graded corrective exercises are given in the pool and should be given again outside the pool if the contractures are at all severe. Electrical stimulation of the muscles may help to lessen and to prevent further atrophy by securing a full deep contraction of the muscles, which may not be possible otherwise. Electrical stimulation must be given as slowly and should be graduated as carefully as the corrective exercises, using only the minimal amount of current sufficient to produce complete contraction of the individual muscle or group of muscles.

All exercises should be done slowly and should be gradually increased in number as the strength and function of muscles return. The patient must assist actively in each exercise. This should be kept in mind, particularly when assisted exercises are being given or when contraction of muscles is being secured by means of electrical stimulation. When the apparatus is no longer necessary, various forms of occupational therapy should be added to help the return of function of the fingers.

In outlining physiotherapy for Volkmann's ischemic contracture, one condition usually present in some degree in these cases should be emphasized, that is, loss of feeling or sensation. The anesthesia may be present in one or more areas, or it may affect the whole limb. In administering any form of heat or other treatment, as well as in the proper care and adjustment of splints and bandages, the physiotherapist must be cautious or further injury may be done to the affected limb as the result of impaired nerve supply.

The results of treatment naturally vary with the extent of involvement, but physiotherapy makes it possible to obtain greater return of function than would otherwise occur.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of THE PHYSIOTHERAPY REVIEW published bi-monthly at Mount Morris, Ill., for April 1, 1932.

State of New Jersey } ss.
County of Essex }

Before me, a Notary Public of New Jersey in and for the State and county aforesaid, personally appeared Dorothea M. Beck, who, having been duly sworn according to law, deposes and says that she is the editor of the PHYSIOTHERAPY REVIEW and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Kable Brothers Company, Mount Morris, Ill.; Editor, Dorothea M. Beck, Montclair, N. J.; Managing Editor, Dorothea M. Beck, Montclair, N. J.; Business Managers, Gertrude Beard, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The American Physiotherapy Association. President, Edith Monro, Boston, Mass.; Treasurer, Mabel E. Holton, Ann Arbor, Mich.; Secretary, Constance K. Greene, Swampscott, Mass.

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DOROTHEA M. BECK,

Sworn to and subscribed before me this 29th day of March, 1932.

GEORGE H. STANTON,

(My commission expires May 2, 1932.)

Orthopedic Surgery and Physiotherapy

By Melvin S. Henderson, M.D., Section on Orthopedic Surgery, The Mayo Clinic, Rochester, Minn.

Orthopedic surgery has gradually won recognition as a specialty. A generation and more ago such men as Sayre of New York, Bradford of Boston, Ridlon of Chicago, Gillette of St. Paul and a few others now regarded as pioneers in orthopedic surgery, had the vision to see the need for the segregation of this type of surgery into the hands of men especially interested in treatment of bone and joint diseases. Patients afflicted with chronic bone and joint lesions such as tuberculosis of the knee, hip, spine, and ankle, lateral curvature, club feet, and so forth, were quick to learn that these men were interested in their condition and would carry their treatment through to completion, whereas the general surgeon busy with other things was really not much interested in their treatment, particularly the important postoperative phase. At that period aseptic surgery was bearing fruit and the abdomen, with its advanced and varied diseases, hitherto opened only in rare instances, was rendered vulnerable to surgical attack. The results were spectacular and dramatic because of the vast number of conditions in advanced stages, such as ovarian systs, fibroid tumors of the uterus, stones in the gallbladder, kidney and urinary bladder. The surgical treatment of fractures, tuberculosis of the joints, and so forth, was overshadowed by this brilliant type of surgery, and as the after care was often tedious and organized efforts to carry it out were lacking, not many surgeons were interested. Consequently even well planned and executed surgical operations on orthopedic conditions often failed because of inadequate postoperative care, and ultraconservative treatment consistently and carefully carried out by the pioneers of orthopedic surgery really gave in the main better results and became more popular than it fundamentally deserved. As time went on the dramatic appeal of abdominal surgery became less, because the neglected advanced cases that gave the brilliant results became fewer, the huge ovarian cysts and fibroid tumors were mostly operated on and increasing care was necessary in diagnosis, and the work became more or less routine. The young medical graduates who became interested in orthopedic surgery met its problems equipped with a sound surgical training which they combined with an understanding and appreciation of the mechanical phase of the work. In the United States, particularly since the World War, orthopedic surgery has rapidly developed as a surgical specialty due to the efforts of such men as Albee, Hibbs, Ryerson, Osgood, Campbell, Allison, Orr, Dickson, Meyerding, Hoke, Gaenslen, Jones, Wilson, Kidner and many others. Along with such development it became evident that there was a need for a group of workers who would fill the gap that existed between the postoperative period and the restoration of function. The modern physiotherapist, with training in anatomy and physiology of the muscular and skeletal structures, will fill that need and will render most valuable aid in the care of the orthopedic patient. Not only does the physiotherapist aid in the physical rehabilitation of the patient, but she brings enthusiasm and encouragement to him at a time when he is feeling the "let down" that often accompanies attempts to regain function and thus contributes to his mental rehabilitation. Physiotherapy is truly a handmaid to orthopedic surgery.

The importance of massage in the training of the modern physiotherapist has been relegated to its proper position. Active motion properly guided is worth many times that of passive movement or the kneading, and so forth, of massage. Baking, massage and diathermy only serve to increase the circulation and are often not only useless but harmful in that they delay recovery if used inadvertently and carelessly and allowed to become routine and colorless. Taken by and large the amount of patient's (and worker's) time wasted in useless measures is, I am convinced, far too great. It is easy in large clinics, particularly where the expense is not borne by the patient, to have a department of physiotherapy, which, even though manned by excellent well-intentioned workers and provided with the finest of equipment, may serve as a sort of catch-all for the patient not only with a definite lesion, but for the patient with indefinite aches and pains for which no lesion can be shown. The old saying "out of sight, out of mind" applies here. The physician, worried and harassed by the patient insistently seeking relief, is anxious to be rid of him by some convenient means, and so refers him for physiotherapy. It is only natural that the head of a department of physiotherapy should take pride in reporting the large number of patients cared for and the many thousands of treatments given. If not watched, such a department develops as does a government bureau and drifts like the proverbial ship without a rudder. Both in this country and abroad I have visited wonderfully equipped physiotherapy units handling large numbers of patients, many of whom, so far as I could see, were wasting not only their own time but that of others concerned in that things done for them were either useless or could be just as well done in their own home by themselves or some member of their family.

In The Mayo Clinic we early recognized the value of physiotherapy, but soon after the establishment of the department realized that there was a tendency for it to be expanded beyond its real worth. A considerable percentage of patients wanted to prolong their treatments beyond the necessary stage, and it was recognized that this would result in an unsound economic

state. Now the primary object of this department in the clinic is for training patients how to carry on the physical therapy at home. A certain number of patients are treated for longer periods, but they are carefully watched to see that no unproductive work is carried on. Relatives are instructed in the types of exercises to be given and instructions are written out for them. If baking is advisable in a case of arthritis the patients are told to buy a baker and instructed in its use. If they live in rural communities where they cannot have access to electrical current a baker that will use "canned" heat is advised. Although no doubt the physiotherapist would carry out the treatments better and more comfortably for the patient, this is often out of the question economically. If the patient lives where the services of a trained physiotherapist can be obtained, and can afford the time and expense it is, of course, advised that the treatments be carried out by the physiotherapist under the general supervision of a physician. However, no one knows better than the physiotherapist how hazy the ideas of the average physician are concerning physical therapy, that is, just what the type of treatment should be and what may reasonably be expected from such treatment, so if possible, a surgeon familiar with the various means at command and their worth should be in charge of the case. I have often been told by patients that they have traveled twenty-five miles or more to a physician's office daily for weeks to have a worker in the doctor's office give a diathermy treatment for a lame back or an arthritic joint, when the application of heat by some means in their own home would probably have done just as well. In a community where no one surgeon or group of physicians could afford to maintain a department of physiotherapy, if all the surgeons in that community would agree to refer their cases to one or preferably two physiotherapists, advantage to all would be attained.

In practically all cases of fracture, when the stage of retention is over and the time for mobility is reached, gentle active movements under guidance and guarded passive movement, gentle massage, and so forth, will hasten the restoration of function and justify the additional expense. However, prolonged and unjustified treatment only discredits both surgeon and physiotherapist. If the fracture is put in the hands of the physiotherapist early she must be cautious, for I have had the misfortune to see seemingly solidly united double fractures of the forearm bow and become deformed under too vigorous manipulations. Many cases of traumatic injuries, such as sprains, are helped greatly by active movements, gentle massage, baking, heat, diathermy or the whirlpool bath.

The knowledge of anatomy and physiology of the muscular system that physiotherapists possess renders them particularly fit to test and grade the condition of the muscles in cases of infantile paralysis. The recorded observations of the physiotherapist made from time to time during convalescence are of the greatest aid in the care of the patient. Infantile paralysis, however, need not be treated by the worker day after day. Parents can carry on treatment, but a check by the physiotherapist occasionally to note improvement is essential not only from the practical but from the psychologic standpoint. The mother may become discouraged and such contact will stimulate her to renewed efforts. The development of deformities, not likely to be noted by parents, can be drawn to the attention of the surgeon by the physiotherapist. In many ways such as these the physiotherapist is able to make her services invaluable not only to the patient but to the surgeon. She has definitely proved her worth and is as necessary today in orthopedic clinics as is the nurse. She helps to restore power to the affected muscles and joints. She can, by sensible and reasonable encouragement, help the patient over the pessimism that may seize him when he sees diminished function and activities as a permanent residue of his injuries, and realizes he must face lowered earning power, and all that it entails. Here is the opportunity of the physiotherapist to offer encouragement and support. She should watch him closely for latent resources and talents that may be developed, and should call in the social worker interested in occupational therapy to see what may be accomplished. By their combined efforts they may see their patient launched on a new career on a sound economic and productive basis.

The After Care of Poliomyelitis

By Wallace H. Cole, M.D., St. Paul, Minn.

Read before a meeting of the Institute of Public Health Nurses, Minnesota State Department of Health, April, 1931

It is impossible for me to approach the subject of the after care of Infantile Paralysis from any new angle and I can only hope to impress upon you the importance of understanding the principles we already know and try to give you a little more in detail how these principles are applied and enforced. To take up the more technical side of treatment is, of course, unnecessary as that is purely a medical and surgical problem and is not our major interest at this time.

There is no clear cut time in the progress of a case of anterior poliomyelitis when we can say: "from now on our treatment is to be considered as after care" for this so-called after care is only a continuation of the application of definite principles which have been in use since the onset of the disease in that individual. The term "after care" is, therefore, somewhat indefinite and I shall take it to mean the treatment of the results of the acute infection of poliomyelitis as differentiated from the treatment of the acute infection itself.

A few words must be said in review about the various stages of the disease if the reasons for the after care are to be understood clearly. Infantile paralysis is an acute infection which typically attacks some of the cells in the spinal cord which control the voluntary muscles and by destroying or interfering with these cells causes paralysis of the muscles correspondingly supplied. In the average case this period of acute infection and reaction to it may be from a few days to several weeks in duration but it gradually passes off into a stage of convalescence during which stage some of the involved muscles regain their power as the controlling cells were only temporarily involved and were not destroyed by the infective organism. In some light cases residual paralysis or weakness may be absent showing that no permanent damage has been done to any of the spinal cord cells but in severe cases, of course, most of the muscles of the body may become paralyzed, thus pointing towards a diffuse and probably irreparable damage to the cord and death may ensue. All possible gradations between these extremes may be present and the average case falls somewhere midway between the two. The time of convalescence is a period of recovery and of finding out just how much damage has been done to the spinal cord but at the end of six months to two years all restoration of power in the muscles usually ceases and we then can place the case in the third stage of the disease or the stage of residual paralysis and, unfortunately, the stage of deformity. I say "unfortunately" as deformity can be almost entirely prevented if the proper after care and treatment is given as I hope to point out in this paper.

What then is the most important factor in this after care? The answer can be given in one word and is emphasized by its brevity, REST. Rest, not only of the individual himself but of the paralyzed muscles, and by this latter is meant also the placing of these involved muscles in a relaxed position. Too much emphasis cannot be placed upon this element of rest and sometimes one of the greatest problems in handling a case of infantile paralysis is to persuade the patients and relatives that you are doing the best possible thing for the child when you are apparently doing nothing. The patients must also always be told that a paralyzed extremity will not grow as rapidly as the normal one and that consequently in the end one leg will probably be shorter than the other unless both sides are involved. During the acute stage of the disease and for a certain period running into the convalescent stage most cases have more or less severe pain and tenderness in the involved parts and it is while this tenderness is present that rest is most essential and meddlesome massage, attempted motion, and lack of recumbancy are emphatically contraindicated. There is little doubt but that the paralysis in many children is made permanently worse by the misguided or ignorant efforts of the parents who cannot or will not believe that rest is so all-important. Those of us who are seeing these cases constantly can give many concrete examples to support this fact.

The methods of applying this principle are not important in their details if they accomplish what is needed, that is, rest and relaxation of the paralyzed muscles. Splints, frames, plaster of Paris or braces may all be used to this end. A simple routine followed by some of us is to place the patient on a canvas covered gas-pipe frame in order to keep the spine straight and the hips in extension, and to keep the lower extremities in metal or moulded plaster of Paris splints with the feet at a right angle and the knees about five degrees from straight. If the upper extremities are involved splints are also made for them unless a simple sling or collar-and-cuff attachment will accomplish the purpose as with a biceps paralysis where we want to keep the elbow bent at all times. On such a frame the patient is much more comfortable and he can be moved with a minimum of pain and discomfort. Care must be taken that the splints also

protect the toes so that the pressure of the bed clothes will not cause trouble.

It is readily seen that in following a routine such as just outlined another great purpose besides rest is being accomplished and that is the prevention of deformity. With an individual properly supported on a frame and in well fitting and efficient splints the parts must remain in good position and they cannot be pulled into some of the extreme positions which we unfortunately still see. There are times when for various reasons a sufficient control cannot be had of the patient and it is impossible to get cooperation in the care of the frame and splints and the application of rest. To overcome this, complete circular plaster of Paris dressings can be applied which cannot be removed at home and which hold the paralyzed parts in the correct position twenty-four hours a day.

During the time after the acute symptoms have subsided but when the tenderness is still present, radiant heat can be used to great advantage over the paralyzed extremities. This stimulates the circulation which always tends to become more and more sluggish and prevents, to a certain extent, the wasting away of the muscles by favoring their nutrition. A very satisfactory method of applying this heat is to have a large cradle holding the bed clothes from the body and lower extremities with two or more incandescent bulbs hanging inside the tent-like structure at all times. More concentrated treatment can be given daily if desired by use of a so-called "baker."

When the tenderness disappears more active physiotherapy can be started and gradually worked up to a maximum for that particular patient. The main forms of the various types of physiotherapy to be used are:

(1) Continuation of the application of radiant heat.

(2) Muscle Training, given under water if possible, and,

(3) Massage.

Muscle training is a highly technical procedure which can only be carried out satisfactorily by some one trained in its methods and it is, therefore, usually only in the larger centers or in an institution where this can be obtained. The work is done on the individual muscles and aims to develop the paths for nerve impulses to the muscles. It is in no way related to any of the usual methods of muscle education and presupposes a thorough knowledge of anatomy and physiology on the part of the operator. When these special procedures are performed under water at a temperature of 88° to 92° Fahrenheit, the parts to be moved are so buoyed up that the effort necessary to cause the movements is reduced to a minimum and the ever present danger of tiring the individual and the muscles is greatly lessened. Even with the facilities of a tank or pool it is frequently found that treatments can be given only every other day as the muscles will not stand daily exercise. It is an easy matter for a weakened muscle to become completely paralyzed as a result of too much forcing and work, and here again one often clashes with the parents who wish things to progress with greater rapidity. Rest is still a primary requisite in the treatment during the convalescent stage and all physiotherapy must be given gradually and be watched minutely so that the effects of the rest are not negatived by fatigue. There are several places in the United States where natural warm water is being used in the treatment of Infantile Paralysis but there is nothing in the chemical composition of the water in these springs which has any effect on the paralysis and the results obtained are due only to the buoyancy of the water as briefly outlined above. Pleasant natural surroundings, large pools of fresh flowing water of the proper temperature and excellent physiotherapeutical and medical supervision make such places attractive for those who can afford it but the same results can be obtained in any well constructed tank or pool as is being demonstrated daily throughout the country.

Massage, although frequently thought to be so important in the after care of poliomyelitis, is in reality only an adjunct to the other physiotherapeutic measures and its chief value is in stimulating the local circulation and helping elimination of waste products in the muscles. It can be used daily in most cases if done scientifically and care is taken not to cause irritation or fatigue. The circulation in an extremity paralyzed or partially paralyzed by infantile paralysis because decidedly lessened, as mentioned before, and massage is very valuable in conjunction with the heat to keep this stimulated to the utmost. The limbs become cold and bluish in typical cases and everything possible should be done to counteract this tendency.

When should an individual with poliomyelitis be allowed out of bed and permitted to sit in a chair or stand and walk? This is always the first question asked a doctor who is in charge of a case and the answer must be conservative for with the average case the period of recumbancy must be around six months although frequently longer periods are necessary. Of course, where only an upper extremity is involved or a minor paralysis is present in a leg the period can be shortened but there is also the other extreme where the involvement is so great that the patient is bed ridden for life.

When the time comes for a patient to start getting up great care must be exercised to prevent stretching of paralyzed or weakened muscle groups and the parts must be held in good position to prevent deformity. This is accomplished by the aid of mechanical appliances such as braces, splints and crutches. Some of these appliances may replace the frames and splints worn up to this time and can be used also at night, or the old apparatus may still be used when the patient is in bed and the newer applied only when he is up. The mechanical aid which comes from the use of orthopaedic appliances allows a certain amount of function which would otherwise be impossible. Lower extremities which could not support the body unassisted can not cave-in on weight-bearing when firmly laced or buckled into a leather and steel apparatus made to fit the parts and when these are moulded accurately there is surprisingly little discomfort to the patient. A spine which tends to become curved due to paralysis in the muscles of the trunk can be held in a correct position by means of back braces or body jackets. These appliances, if properly made, allow the chest and abdomen a certain amount of freedom so that breathing and eating are not interfered with to any extent. When the muscles at the hips are paralyzed some outside support is necessary to keep the body upright at the thighs and nothing has ever been devised to accomplish this which is as good or as efficient as a pair of crutches. In cases with this paralysis around the hips great care must be exercised at all times to prevent the development of a deformity where the thighs, to a greater or lesser extent, become permanently bent on the trunk. This can be accomplished by stretching of the muscles on the front of thigh and hip daily.

During the latter part of the period of convalescence when appliances are being worn and the patient is ambulatory, the physiotherapeutic measures above mentioned must be actively continued and even aug-

mented, if the progress of the case warrants it. With a patient at home in the country only the crudest of amateur treatments are, of course, available but given a responsible parent the fundamentals can be taught and much good result. Stress should be put on the necessity for keeping the extremities warm and two or even three pairs of woolen stockings must be worn during the colder weather. Where joints are present in the braces these must be oiled regularly, the same as any moving part in a piece of mechanism, so as to do their part smoothly.

When all recovery of power in the involved muscles has ceased, and we cannot be sure of this in under two years in the average case, the problem of getting rid of appliances and substituting for them some operative stabilization arises. There are many cases where, of course, it is impossible to do anything further and the individuals are condemned for the rest of their lives to wear appliances of one kind or another, but fortunately there is also a large group where by operative interference the use of braces can be obviated. In some of these the function of the parts becomes so excellent after the radical treatment that practically no disability for ordinary activities exists. In others there is still a need for mechanical support but the nature of this support can be simplified and lightened. The whole field of the operative treatment of residual infantile paralysis is very encouraging and the results from the functional point of view so good that the future seems bright for still greater advances. It is only during the last five or six years that any prominent attempt has been made to lengthen a leg which, as a result of poliomyelitis, has not grown as rapidly as its mate but now this is not an uncommon procedure.

I have not put any stress on the correction of deformities due to poliomyelitis because I would wish to have uppermost in your minds the fact that deformity is a preventable complication and with proper early treatment should rarely occur. We still see many cases with marked deformity coming into the hospitals but as doctors, nurses and parents become better educated the number of such cases should gradually decrease.

There is one last point which I wish to bring up before closing this rather rambling discussion of the after care of poliomyelitis and that is the absolute necessity of frequent checking up of all cases until such time as the end result is reached. The fitting of splints and braces must be watched in order to see that the paralyzed parts are held in good position and that deformity is not developing because of maladjustment of the apparatus. Post-operative cases may relapse even with the best of after care but careful watching will keep the number of such cases at a minimum. The home conditions should always be investigated where possible in order to make sure that the individual is being correctly handled there as much wasted effort goes into supplying children with braces and other apparatus which is removed at home because the child makes some complaint about it. Deformities recur and the future treatment becomes decidedly more difficult and less satisfactory when this is the case.

I will close by summing up briefly what I have endeavored to bring before you on the after care of poliomyelitis.

The after care is the treatment of the results of an acute infection (anterior poliomyelitis) in the spinal cord as distinguished from the treatment of the infection itself.

For descriptive purposes Infantile Paralysis can be divided into three stages:

(1) Acute Stage.
(2) Convalescent Stage.
(3) Stage of residual paralysis and deformity.

During the acute stage a certain amount of paralysis develops in the typical case and as a result of this paralysis we later get sluggishness of circulation, shrinkage in size, and retardation of growth in the involved extremity.

The main principles of treatment which must be applied in the after care, the use of some of which must be started as soon as the paralysis is diagnosed are:

(1) REST.
(2) Prevention of deformity.
(3) Heat to the paralyzed parts.
(4) Graduated physiotherapy after local sensitiveness has disappeared.
(5) Mechanical supports for allowing patients to become ambulatory during the latter part of convalescence.
(6) Operative procedures to stabilize and balance paralyzed parts when the stage of residual paralysis has arrived and as a result to obviate the necessity of mechanical supports in many cases.

During all stages of the disease great care must be used to prevent fatigue and constant supervision until the end result is obtained is the ideal.

Special Offer to Association Members by the British Journal of Physical Medicine

We are asked to announce that a special "privilege offer" is being made to members of the American Physiotherapy Association by the British Journal of Physical Medicine. This Journal which is published under a distinguished Editorial Board of famous specialists, is primarily intended for medical men, but its contents have proved so valuable that very considerable numbers of assistants who administer various forms of physical treatment in Britain under medical supervision have found it essential to read the Journal regularly in order to keep in touch with current progress and to be able to carry out any treatments that may be ordered.

For this reason the publishers think that many similar persons in the United States would be glad to avail themselves of the services of the Journal. They therefore offer to supply it for one year (12 issues post free) to any member of the American Physiotherapy Association for the sum of only 3 dollars 50 cents, instead of the regular price of 5 dollars.

This price includes all the special numbers published during the year (e.g., "Rheumatism," "Treatment of Common Ailments," etc.).

We are asked to add that a specimen copy will be sent to any member of the Association who writes quoting this announcement to the publishers at 17, Featherstone Buildings, London, W. C. I.

Traumatic Injuries of Peripheral Nerves

*By Willis S. Peck, M.D.**

Read before the Tenth Annual Convention of the American Physiotherapy Association, Philadelphia, Pa., June 8-11, 1931

The recovery from severe traumatic lesions of peripheral nerves is dependent upon accurate diagnosis, proper surgical intervention, and preservation of the paralyzed muscles. The two most important points in diagnosis are the localization of the nerve injury and the estimation of degeneration in the paralyzed muscles. The treatment rests to a great extent upon these findings. Surgical repair of nerves cannot be performed without locating the site of injury and proper treatment of the muscles is determined by first estimating the amount of muscle degeneration. Repeated examination of the muscles must also be made during the paralytic period, the findings serving as guides to the dosage of artificial muscle exercise.

Physical therapeutic measures offer almost nothing which will directly affect the regeneration of the injured nerves. It is to the care of the muscles that treatment is directed. These are exercised by artificial muscle stimulation to prevent atrophy and to maintain the muscles in such a physiologically healthy state that they will respond to the stimuli from the central nervous system when nerve continuity is re-established.

In reviewing the histology of peripheral nerves it is recalled that the single cell forms the basic unit and that all peripheral nerve trunks are composed of extensions from many cell bodies in or near the spinal cord. The single peripheral nerve cell is composed of the cell body, a long fiber connecting it with sensory or motor end plates and one or more fibers connecting it with another nerve cell in the spinal cord or brain. There are two main types of nerve cells which enter into the formation of the peripheral nerve trunk—the motor cells and the sensory cells. The motor cell bodies lie in the anterior horn of the spinal cord and are known as the lower motor neurons. They form a synapse or connection with the nerve filament or axis-cylinder of upper motor nerve cells which extends down the spinal cord from the brain. The lower motor cells send out their axis-cylinders to the motor end plates in the muscle fibers and so are able to transmit stimuli which will cause muscle contraction. Each of these axis-cylinders is surrounded by the myelin sheath which in turn is enclosed by the neurolemma. It is supposed that these layers help to insulate the axis-cylinder and prevent spread of stimuli to other fibers in the nerve trunk. The bodies of the sensory cells lie outside of the cord in the posterior root ganglia. There are two principal extensions from these cell bodies, one connecting with the receiving mechanism in the skin or other tissue, and the second connecting with a cell in the cord which will transmit the simulus of sensation to the brain.

Each nerve trunk contains hundreds of these axis-cylinders which usually come from more than one level of the cord. Sensory and motor fibers are combined in closely packed bundles and held together with strands of fibrous tissue which are woven about the axis-cylinders. This network supports and protects the nerve fibers so that they are less liable to injury from pressure or stretching.

Examination of a nerve trunk cut across the long diameter shows that a number of comparatively large bundles are held together by a fibrous tissue. On inspection with greater magnification these bundles are shown to be composed of smaller bundles of axis-cylinders. From this it is evident that trauma of a nerve trunk sets up a complicated situation, the repair of which requires minute adjustment.

The function of the axis-cylinders is dependent, not only upon the physiological state of the nerve cell, but also upon the continuity of the entire cell system. The impulses transmitted along the axis-cylinders are readily interrupted by any change in either of these conditions. When this occurs a pathological change takes place in the axis-cylinder. If the injury is profound that portion of the axis-cylinder distal to the lesion will degenerate and not until a new axon is sent out from the proximal and uninjured portion of the cell can impulses be transmitted to the muscles.

Before taking up the diagnostic methods it is also advisable to review the course of degeneration and regeneration in a sectioned nerve fiber. Every nerve fiber that is divided must undergo degeneration (Wallerian degeneration) in the portion distal to the point of separation, because that part is separated from the trophic center. This degeneration is first shown by the splitting of the axis-cylinders into small fragments which finally disappear, by the disintegration of the myelin sheath into small globules which also disappear, and by the proliferation of the nuclei in the neurolemma or sheath of Schwann so that they appear as an indistinct network. This degenerative process is usually well advanced in three or four days and is complete in two or three weeks. The distal end of the nerve fibers still in contact with the nerve cell likewise degenerate to a certain extent. However, this process in the proximal portion of the nerve fiber is slight and within a few days regeneration usually starts from this point. At the same time that the axis-

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cylinder is degenerating, continuity of the peripheral structure is being reestablished by the proliferation of the cells forming the neurolemma, so that the two portions of the divided nerve fiber are again united. About the fourth day the axis-cylinder begins to extend into the mass of sheath cells and as this takes place these cells gradually arrange themselves into a surrounding tube. Shortly after this, regeneration of the myelin begins and the nerve fiber is reformed. Since this regeneration starts only from the portion of the axis-cylinder attached to the body of the nerve cell and must extend the full length of the nerve fiber at a rate not greater than 1 mm. per day, it is readily understood that the period of paralysis frequently extends over a number of months.

If nerve repair were as simple and sure a process as has just been described peripheral nerve injuries would not present the problem that they do. Unfortunately, most peripheral nerve injuries do not leave the interrupted nerve fibers in direct contact. Many different types of impediments may arise which will delay or prevent regeneration and all of these must be considered when diagnosis is attempted. When the nerve trunk is sectioned the ends of the nerve may be drawn apart so that continuity can never be re-established without surgical intervention, the ends may be re-attached by a small fibrous cord which will not permit regeneration of more than a few axis-cylinders, the ends may be partially divided so that nerve supply is maintained to a portion of the muscles innervated through the nerve trunk, or the nerve ends may be united by dense fibrous tissue which will not permit the passage of regenerating nerve fibers. Should tearing or crushing of the nerve trunk take place instead of division the results may be equally disastrous. A complete crushing gives total paralysis and requires the whole process of regeneration before the nerve will function. Neuroma may occur so that the regenerating axis-cylinders are blocked and turned back, forming a nodule of interwoven nerve fibers which will never be of functional value if surgical intervention does not take place. Such a process may involve a portion or all of the nerve trunk. Hemorrhage into the sheath may also produce varying degrees of destruction by organization of the blood clot. The formation of bone callus from a fracture and the formation of fibrous bands after soft tissue injury are frequent causes of pressure which will destroy nerve continuity. The presence of intense swelling in the soft tissues about the nerve trunk, the pressure from crutches in the axilla, the pressure of improperly applied counter traction rings in the axillary region, and pressure from plaster splints over the common peroneal nerve where it winds about the fibular head are infrequent accidental causes of varying degrees of nerve injury.

From this enumeration of the principal pathological conditions which may occur in a nerve trunk and from the variety of etiological factors which must be considered it is readily understood that diagnosis must include all sources of information which are at the command of the examiner.

Diagnosis is made from the history of the injury and the clinical examination of the patient. The latter is composed of the direct examination of the injured part, determination of passive joint function and active muscle function, and the electrical examination of the injured nerve and paralyzed muscles. Elimination of any one of these divisions will make the diagnosis incomplete.

Briefly, the salient points in the history are the date of injury, the exact description of the injury, the immediate effect of the injury on the function of the part, and the subsequent progress of the lesion. The direct clinical examination must include a study of the position or attitude of the part, because certain ones are characteristic of well defined nerve injuries. It must determine whether joint function is limited by contracted muscles, joint capsule, or scar tissue instead of loss in functional power of muscle. The quantity of force which can be exerted by different muscles or muscle groups is next determined and the findings recorded in figures which represent reproducible units. It is at this point that testing with electrical currents may be used very effectively. The alternating current from an induction coil, which is a type of faradic current, can be used to stimulate nerve tissue. It will not, however, stimulate muscle directly because individual stimuli do not last long enough.

In performing this examination a large electrode is placed on some remote portion of the body, usually over the back, and a small electrode with a diameter from one to three centimeters is used for stimulation over the nerve trunk. A key is placed in the circuit supplied by one or more dry cells. Stimulation is first applied over the nerve trunk and above the lesion. When there is no response in the muscles supplied by this nerve, even though the current is strong enough to cause a sharp contraction in the muscles supplied by the corresponding nerve on the opposite side, it may be concluded that there is a block to transmission in that nerve.

Next, the nerve supplying the individual muscles should be tested by stimulating over the motor points of each. The motor point is that region on the skin where the main nerve trunk supplying a muscle comes nearest the surface. If the individual muscles do not respond to stimulation which is sufficient to create a response in corresponding muscles on the opposite side it is evident that the muscles are paralyzed. On the other hand, if there is a quantitative decrease in muscle contraction degeneration is incomplete. Such a condition is frequently encountered when there has been pressure upon the nerve trunk without a complete break in continuity and also at the time when the muscle is being re-enervated by new nerve fibers. Testing with faradic current provides a method of determining whether the nerve supply is present or absent and is very useful in those cases where the functional test leaves some doubt as to the presence of voluntary contraction.

Only in those muscles which are completely paralyzed will stimulation with galvanic shocks give much information that cannot be gained by any other method. This type of stimulation does, however, prove of great value in studying the physiological condition of paralyzed muscle and is used as a guide to dosage with exercising currents.

Paralyzed muscles are tested with galvanic current in order to determine three things: First, the state of muscle irritability; second, the type of contraction; and third, the presence or absence of polar inversion. Muscles which have lost their nerve supply require more intense stimulation with the galvanic current than do normal muscles. This is shown by a comparison of the amounts of milliamperage. The type of contraction is quite indicative of paralysis, since denervated muscles have a slow and delayed response. Frequently the amount of current necessary for stimulation is so great that the stimulus spreads to unparalyzed muscles. These will respond by contracting and relaxing and then be followed by contraction in the paralyzed muscle.

Change in the polar formula is not as pathognomonic of complete paralysis as the decrease in muscle irritability and the delayed and slow contraction but it does have value in substantiating the diagnosis. Normally the muscles respond to the smallest amount of stimulation with the cathodal closing stimulus, but in paralyzed muscles it is necessary to stimulate the muscle fibers directly so that these muscles contract upon stimulation with the anodal closing stimulus applied on the skin surface. The reason for this change in the apparent irritability to the positive or anodal pole is due to the fact that the negative or cathodal pole is the only one that ever stimulates and it now lies in the body of the muscle instead of at the motor point.

When the physiological state of each muscle has been investigated it is possible to determine how much exercise each should receive without producing over fatigue. Also, as treatment progresses recheck of the muscles will indicate whether or not the muscles are maintaining their physiological condition.

Treatment of partially or completely paralyzed muscle is based upon the maintenance of nutrition. The normal tone and the stimulus of function in paralyzed muscles are absent so that they lie inactive. These muscles, like any other parts of the body which are not used, gradually degenerate until they are forever incapable of their normal function. It is toward the prevention of this dissolution that the application of heat, massage, and exercise are pointed. External application of heat causes the production of a superficial active hyperemia which helps to bring more nutritional material to the involved part and also helps to carry away the waste products at a greater rate. Massage tends to create better circulation and drainage of the effected muscles. There is also the probability that it affords some passive exercise of the muscle fibers. Unfortunately, much of the value of massage is lost because of the absence of the reflex nervous effect which causes involuntary contraction of muscle fibers. Passive motion of the part is of little benefit to the muscles but should be used to prevent contraction in the unparalyzed opposing group, especially since they are immobilized in a splint most of the time. Artificial muscle stimulation by means of the slow sinusoidal current offers the best method of producing exercise in completely paralyzed muscles. The rhythmical, slow, and carefully applied stimulation which does not fatigue the muscle fibers causes an exchange of nutritional material and waste products in the stagnant lymph and blood channels of the entire muscle. Frequently this stimulation is applied too intensely and over too great a time. It is advisable to produce only a mild contraction of the muscle, five to ten times during a treatment, otherwise the fatigue may be more dangerous than no treatment at all. The daily or twice daily exercise of paralyzed muscle by this method should be carried out as long as there is no voluntary control or until the patient's condition is hopeless, since it frequently is months before regeneration takes place.

Upon the return of slight functional activity artificial muscle stimulation should be discontinued. Active exercise is now the method of choice. The contraction of only a few muscle fibers which have regained their nerve supply is more valuable in maintaining the nutrition of the muscle than that which can be accomplished by artificial stimulation. These muscles should now be treated so that they may perform the maximum amount of work under the most favorable conditions, care being taken to prevent fatigue.

The brine bath seems to answer this need most satisfactorily since its buoyant effect and the heat provide favorable conditions for exercise in a normal manner and in all directions. As the amount of muscular power increases the exercise should become more strenuous, care being taken to grade the work according to the stage of restoration in each muscle. Other forms of therapeutic exercise outside of the brine bath or therapeutic pool may now be used, especially those which tend to return the patient to his usual vocation. It is frequently advisable to plan a program which the patient may carry out at home, because many of them do not come to the hospital after moderate function is regained.

SUMMARY

Diagnosis of peripheral nerve injuries is best carried out through the use of a careful history and clinical examination which includes investigation of joint function, active muscle function, and electromuscular diagnosis.

Physicians performing this work should have a thorough knowledge of the condition of the patient's paralyzed muscles before prescribing the treatment.

Physical therapeutic measures, namely, heat, massage, and exercise, both artificial and passive, afford the best agents for maintaining paralyzed muscles in a physiological state.

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Abstracts

By John S. Coulter, M.D.

The Response of the Gastro-Intestinal Tract to External Electric Stimulation. By Gardner S. Reynolds, M.D., Departments of Roentgenology and Physical Therapy, Henry Ford Hospital, Detroit, Michigan, in Radiology, XVII:6:1276, Dec. 1931.

It was felt that valuable information could be secured by fluoroscopic observations of the stomach and colon through the abdominal wall while they were under electric stimulation. The gastric study was included along with that of the colon, not primarily for the purpose of studying the effects of electric stimulation on gastric function itself, but rather on account of the ease and relative accuracy of observation of the effect of electric stimulation of smooth muscles, due to the unusually deep and regular peristaltic waves occurring in the stomach. In contrast to this regular gastric peristalsis, neither the mass movements nor the small fibrillary colonic peristalsis is often seen fluoroscopically. The colonic observations then were necessarily confined to: (1) apparent tone, (2) movements of the colon, and (3) change of position of fecal material within the colon. The observed tone of the colon, of course, varies with the completeness of its filling, the position of the body, etc.

TECHNIC

For the experiments, a small group of doctors and experienced technicians was selected. Their familiarity with the equipment and the proposed experiment made it possible to rule out psychic effects. All of the stomachs were noted to be organically normal by preliminary barium meal.

The current used principally was a slow sine wave (8-a-minute) impressed on a 60 cycle alternating current of 20 volts and sufficient amperage in each case to produce strong physiologic contractions of the abdominal wall. Direct current with a surge of 8-per-minute was also used, although it was less efficient in producing contractions of the abdominal muscles. With both currents, a large electrode was used posteriorly at about the level of the diaphragm and a smaller one close to, but not directly over, the part to be stimulated. The equipment was one of the satisfactory low-voltage generators commonly employed. The voltage and amperage, of course, were not controllable independently of each other.

OBSERVATIONS

Stomach.—Electric stimulation over the stomach, using the technic previously described, failed to produce any consistent change in tone or peristalsis. At the time of contraction of the abdominal muscles, the cardia of the stomach became more nearly filled, due to the increased intra-abdominal pressure. At times the electric stimulation appeared to initiate peristalsis, but never in a specific or consistent manner. As much change in peristalsis is frequently noted after manual palpation. At other times, the current appeared to inhibit peristalsis and to produce a tendency toward a spastic hypertonia. Smaller amounts of current were also used. With them there were fewer cases of inhibited peristalsis and there was even questionable improvement in peristalsis. Other variations of both alternating and direct current in common clinical use failed to produce any definite stimulation of gastric peristalsis.

Colon.—Twenty-four hours after the gastric examination, colonic stimulation was attempted with the above technic. The following observations were made: (1) Applications of the surging sine wave to the abdominal wall to the extent of producing strong contractions of the abdominal muscles gave rise to an alternately ascending and descending motion of the colonic flexures which was not distinguishable, except for differences in rate and timing, from the motion of the colon produced by deep diaphragmatic breathing. That this motion of the colon was not due to respiration was determined by coincident palpation of the abdomen and thorax. This movement of the colon was apparently due to stimulation of the diaphragm. (2) The alternate lengthening and shortening of the ascending and descending colon produced a slight suction effect within the colon, evidenced by the motion of particles of barium within the lumen. (3) The contraction of the abdominal muscles produced a certain massage effect on the colon. (4) The immediate effects on colonic tone and peristalsis were not definite, though there seemed to be at times a slight increase in tone.

CONCLUSIONS

1. Electric stimulation of the external abdominal muscles over the barium-filled stomach did not produce, during the time of fluoroscopic observation, any consistent or specific changes in gastric tone or peristalsis.

2. Relatively large amounts of current seemed to decrease peristalsis, while smaller amounts of current seemed occasionally somewhat to increase gastric peristalsis.

3. Electric stimulation over the barium-filled colon produced the following changes:

(a) Ascent and descent of colonic flexures and transverse colon, apparently due to diaphragmatic stimulation producing a motion of the colon indistinguishable from that occurring in deep diaphragmatic respiration. This was not due to increase of intra-abdominal pressure as the movement was paradoxic, i. e., the colon descended coincidentally with the contraction of the abdominal muscles.

(b) Secondary to this ascent and descent of the colon, an alternate lengthening and shortening of the colon occurred resulting in a to-and-fro movement of

the colonic contents, more particularly in the region of the flexures. This, however, was not very striking.

(c) A certain amount of massage effect on the colon was noted, due to the strong contractions of the abdominal muscles.

4. The experiments emphasized the great value of electric stimulation in developing the abdominal muscles. This phase is still insufficiently used on patients for whom active exercise is not advisable and for those who fail to carry out exercise instructions.

5. These conclusions are based on the immediate effects of electric stimulation of the gastro-intestinal tract and do not necessarily carry any implications as to the results obtainable in a series of treatments.

Principles of Orthopedic Treatment of Chronic Non Tuberculous Arthritis. A. G. Timbrell Fisher, M.C., F.R.C.S., Late Hunterian Professor of the Royal College of Surgeons of Eng.; Formerly visiting surgeon with charge of special clinic to the Ministry of Pensions Hospitals, Orpington, and surgeon with charge of out patients to the Seamen's Hospital, Greenwich; in the Practitioner, CXXVII:5:537, November, 1931.

(A) *Cases unassociated with deformity.*—During the acute stages, when muscular spasm is a prominent feature, every effort must be made to prevent the onset of deformity.

The importance of physiotherapy.—It is characteristic of chronic arthritis that eventually the acute symptoms subside, and the joint may become comparatively painless, although, of course, other joints may become progressively involved. Our aim, therefore, should be to direct our energies towards maintaining the nutrition of the joint, preventing deformity and ankylosis, keeping up its range of movement, and maintaining the tone of the muscles acting upon it. In this way we assist the very real reparation powers present in the joint (vide the remarkable phenomena of false joints), and when the more acute symptoms have subsided, the patient may still possess a joint retaining useful function. By the older methods of complete and uninterrupted rest, the patient was sometimes left with a stiff joint for life, often in a position of deformity, and the limb was usually weak and helpless from extreme muscular atrophy.

Except in the most acute cases, great benefit will result from daily applications of radiant heat, massage of the affected limb or limbs, and carefully graduated movements, both active and assisted. Radiant heat relieves pain and muscular spasm and improves the circulation of the joint thereby aiding the nutrition of the joint structures. It is of value in softening scar tissue and adhesions, and by its analgesic and anti-spasmodic action is a valuable preliminary to massage and movements.

Massage.—As stated elsewhere, "unless this valuable method of treatment is practiced in a proper manner, with a due regard for underlying principle, and with a clear idea in the mind of the masseur of what is aimed at in any particular case, the treatment may be not only futile, but actually harmful.

Avoidance of faulty posture.—In recumbent cases particularly an insidious type of flexion deformity of hips, knees and ankles is liable to occur, because the patient is propped up in the bed with the knees flexed over a pillow, without precautions to prevent the weight of the bedclothes from gradually forcing the feet into a position of talipes equinus or equinovarus. This characteristic syndrome of deformity is far too frequently encountered, and it is a shortsighted policy if the medical attendant, in an attempt to make the patient easier, allows these dangerous positions to proceed.

(B) *More acute cases in which deformity has supervened.*—It is preferable to correct any deformity present by continuous extension rather than by manipulation, and certain mechanical points concerning the application of such extension are very important; for extension if wrongly applied, may cause increased pressure between diseased articulating surfaces, increase pain and muscular spasm, and thus do far more harm than good. Correction of deformity by weight extension finds its principal indications in the lower extremity.

Chronic cases associated with deformity.—It can scarcely be sufficiently emphasized that nearly all deformity should be preventable by attention to the simple principles enumerated, and that, judging from the enormous number of deformed joints seen by any busy orthopedic surgeon, these principles are still very far from being generally realized. The most frequent deformity is a joint which has become fixed to a greater or lesser degree by adhesions in some position which has functional disadvantages. Every degree of stiffness may occur, from that of a joint with its movement but slightly restricted by fibrous adhesions, either intraarticular or capsular, or both combined, to a joint which is firmly ankylosed either by dense fibrous tissue or by actual bone.

Manipulation.—There is no dogma that is more sedulously copied from one textbook to another, and none that has been so damaging to our profession, by encouraging the activities of unqualified bonesetters and osteopaths, than that which absolutely and without exception condemns manipulation under anesthesia in the treatment of joints whose movements have become impaired owing to the formation of adhesions in the course of chronic arthritis. Cases in which manipulation is definitely contraindicated will be mentioned later, but there are many forms in which it is of extraordinary value, if performed by a medical man who, with the necessary inborn qualities, has specialized in this work after years of experience. It is unfair and illogical to condemn a valuable method of treatment root and branch because of occasional unsatisfactory results seen when the method has been practiced by the inexperienced or the unqualified in unsuitable types of cases. In the majority of cases pain in the joint is actually lessened by manipulation if properly performed, and this can be readily understood if it is remembered that the intermittent stretching of adhesions and scar tissue are among the commonest causes of pain in the arthritic joint. Similarly, the number of cases that do not benefit, sometimes to the extent of being transformed from bedridden cripples to states of modified activity, is usually very small in experienced hands.

Pedographic Impressions in School Children. Donald B. Hull, M.D., Ridgewood, New Jersey, in J. M. Soc. New Jersey, XXVIII:12:928, Dec. 1931.

Why bother with an examination of the feet? Will anything be done about defectives? Emphatically, yes. In the Ridgewood public schools we examined 2650 students this past fall and found 149 defects, 5.6%; 106 with both feet flat, 41 with a single foot flat, and 2 cases of pinched toes. Notices were sent to parents, to be taken to the family physician, and signed after a check-up of our diagnosis and treatment had been started. Considerable favorable comment came from the parents, as well as from the physicians who benefited by a little increased business. In May, follow-up impressions were taken and 33 pupils (31%) were noted to be improved in both feet; 17 (41%) improved in a single foot; a very satisfactory showing for the first year of this work. Part of the credit is due to the corrective exercises taught by the head of the physical education department in group classes. Should the parents or the family

physician desire the pedographic impression, we gladly furnish it from our files.

Three types of flat-food must be recognized: (1) Postural flat. Forrester-Brown estimates that 60-80% of the children in England suffer this type. Knock-knee and other postural defects are always associated with it.

(2) Rigid flat. Where there is actual bony, irreparable deformity.

(3) Congenital flat. Apparently nothing corrective can be accomplished with the last type after 5-6 years. At the Paterson General Hospital where complete foot imprints are taken of all new-borns, for identification purposes, I am impressed with the large number of congenitally flat feet observed.

SUMMARY

(1) Pedographic impressions can be made with an inexpensive piece of apparatus, if purchased, or made quite simply in the home shop.

(2) A permanent impression can be judged comparatively and filed for future reference as to degree of improvement, or can be sent to the parents and the family physician for his use.

(3) Certain conditions, chiefly congenital must be recognized as uncorrectable.

(4) Foot abnormalities are a positive detriment to the health and activity of the school child and a menace to his health and happiness in adult life.

(5) In Ridgewood we have corrected 33% of the defective feet in the first year of this work, a result that is worth achieving and which should prove the value of pedographic impressions in other schools throughout the state.

Sciatic Scoliosis. By D. S. MacNab, M.D., F.A.C.S., Calgary Associate Clinic, Calgary, in Canad. M. A. J., XXV:6:689, Dec. 1931.

For the sake of simplicity in outlining the treatment, I am dividing the cases into mild, moderately severe, and severe, depending on the intensity and duration of the symptoms.

Mild.—In the mild cases, a cure may occur spontaneously, the patient continuing with his work. He may, however, require certain assistance, such as the ordinary analgaesics, massage and mild counter-irritation, the use of radiant heat, and possibly a belt or grid-iron strapping with ordinary adhesive tape.

Moderately Severe.—Patients will probably have to submit to rest in bed and may have to be manipulated under an anaesthetic for help in restoring the lumbar curve and breaking down adhesions, this to be followed by massage, radiant heat and diathermy, and by the use of a belt or light spinal brace or jacket. The patient should resume his occupation only after a period of re-educational exercises, and the whole will probably require from three to six weeks.

Severe Cases.—These require manipulation according to the Jones method, the application of a cast from just below the arms to the knees, care being taken to see that the normal lumbar curve is re-established. The patient remains in this position in bed for about six weeks. After removal of the cast, the patient is allowed up and about very gradually, massage and re-educational exercises being given for several weeks. He should be allowed back at work in from six to eight weeks after the case is removed, and should wear a belt or jacket. The underlying condition should receive careful attention and all foci of infection removed and occupational factors corrected when possible.

Treatment of Sprained Ankles. W. E. Tucker, F.R.C.S. (Eng.); Clinical Assistant, Orthopedic Department St. George's Hospital, Lewisham; in The Lancet II:XVI:848, Oct. 17, 1931.

1. Radiograph all sprains except mild ones.
2. Rest the damaged structures.
3. Strap or bandage so that the foot is dorsiflexed to a right angle—a most important point, on account of the risk of shortening of the tendo Achillis from faulty position, and adhesions, from the products of effusion gravitating posteriorly while the patient is in the recumbent position.
4. In bad sprains give some form of analgesic and hypnotic for at least the first night; the pain may be so bad that even morphia is required.
5. During the act of spraining the ankle, excessive movement undoubtedly takes place at the subastragaloid and mid tarsal joints, as shown by effusion and injury to the ligaments; therefore, when passive movements are started, remember to put these joints as well as the ankle joint, through their full range of movement.
6. After a sprained ankle, there is a tendency for the foot to become flat and painful, especially if strapped in the everted position. In order to prevent this, encourage the patient to do foot exercises to strengthen the muscles; an inside wedge or valgus support may be necessary while carrying these out.

Scheme of Treatment.—I suggest that the following methods are efficient, and if carried out rigidly, will prevent chronic sprains. Warn the patient that it may be three to six weeks before the ankle is normal.

Moderate Degree.—(1) Ankle firmly strapped, walking allowed if not painful. (2) Massage and radiant heat applied over the strapping, and active movement, without producing pain allowed from the beginning and continued until there is no pain or limitation of movement. (3) Strapping is removed on the 4th day, and if the ankle seems sufficiently recovered—as shown by absence of pain on passive movement to its full extent—and it is thereafter supported by an elastic anklet or crepe bandage until it feels to the patient completely recovered. (4) Do not forget to advise foot exercises to prevent recurrence, and also to guard against a painful flat foot.

Severe Degree.—(1) Confine to bed for a week if possible. (2) Firm pressure with bandages over lint soaked in some evaporating solution—e.g., liquor hamamelis one in six, or lotio plumbi cum opio. Do not strap bad sprains at first but apply some form of evaporating lotion with firm bandaging. Swelling and edema invariably occur and the patient suffers agony. On the other hand, firm bandaging over lint soaked in an evaporating lotion maintains the foot in correct position, rests the injured structures, and keeps the swelling from becoming excessive. (3) Next day the ankle is massaged gently, heat is applied, and active movements, without producing pain, are encouraged. Continue this treatment at least once each day, as it will help the absorption of effusion and hemorrhage; a further range of movements should be obtained on each occasion. If available, diathermy through the ankle and surging faradism to the muscle will help to absorb deep seated effusion quicker than any other form of treatment. These can be applied from the first and their value can be estimated by the rapid return of the ankle to normal. (4) At the end of a week allow the patient up with the foot supported either by strapping, a firm bandage, or an elastic anklet. Massage and physiotherapy are continued until full range of active movements is ob-

tained without pain. The patient should carry out exercises.

Chronic Sprained Ankle.—Those cases that have had a certain amount of treatment but experience pain, localized to the upper part of the ankle, and limitation of movement.—(1) Damaged structures being maintained in the wrong position and therefore stretched. (2) Tenosynovitis of one or several of the tendon sheaths. (3) Unabsorbed effusion in the subastragaloid and metatarsal joints. (4) Adhesions, especially posteriorly around the tendo Achillis, and around either malleolus. If this class of sprain is seen within the first month, massage, movements and physiotherapy is undoubtedly the best treatment, with the ankle supported in the correct position.

Forcible Extension in An Ankylosed Joint. Franklin H. Church, M.D., Salem, N. J., in J. M. Soc. New Jersey, XXVIII:12:914, Dec. 1931.

The patient, aged 30—a solitary arthritis of the left knee. At that time the knee was fixed in extreme flexion and there was considerable swelling and brawny induration. Tenderness was extreme and no manipulation or traction was permitted. At last, a degree of quiescence was obtained, when manipulation could be undertaken.

Under ether, it was seen that a considerable degree of mobility could be obtained by forcible manipulation and the extension gained was retained by a circular plaster cast. This trauma relighted the arthritis for a week or more. After this had subsided the patient was taken to the treatment room and a large, 10 in. iron turnbuckle, such as may be obtained in any hardware store, having had the protruding ends of the bolts flattened and bent by a blacksmith to suit, was incorporated by further plaster bandages into the back of the cast. The bolts of the turn-buckle were left as closely together in the center as possible. Two other jointed iron straps were also incorporated on each side of the knee for support. After the fresh plaster had hardened for a few days, a space 2 in. wide was cut entirely through and removed from about the knee, and extension obtained slowly by taking a turn or two of the turn-buckle each day as the comfort of the patient would allow. The distance gained between the screws was about 8 inches. After some weeks, and the maximum of extension was gained, the patient was allowed out of bed on crutches from which she graduated to a cane and then to "free wheeling."

Bier's (Arterial) Hypereamic Method. Arthur Heys, M. B., Edin., late Hon. medical officer, Jersey Dispensary and Infirmary, Jersey C 1, in The Lancet, II:XX: 1073, Nov. 14, 1931.

According to Prof. August Bier of Berlin, inflammation in itself ought not be regarded as a disease, but rather as an attempt of the body to resist the attendance of an invading foe. To increase this inflammatory hyperaemia, resulting from the fight of the living body against the invader, is the aim of Bier's hyperaemic treatment. There are several methods by means of which hyperaemia may be produced: (1) by an elastic bandage; (2) by cupping glasses; (3) by hot air.

Any part of a body brought near to a source emitting strong heat becomes bright red or hyperaemic. The hyperaemia produced by this method is different from that caused by obstruction. The latter causes what Bier calls venous hyperaemia, the former an arterial one.

A great number of cases of old standing arthritis, for example, whether rheumatic, traumatic or gouty, which are often very difficult to benefit by ordinary methods, are quickly relieved and cured by hot air treatment. A second class of case that can be treated advantageously by hot air hyperaemia is neuralgia of all varieties.

Dry hot air permits the use of a very high temperature without injury or pain to the part to which it is applied. I have often seen the thermometer register 250 F., while the patient felt the reverse of uncomfortable—in fact, often inclined to go to sleep. In cases where Bier's method is useful the powerful effects of the hot air bath can be made good use of in causing rapid absorption of exudations of blood and serum. It was whilst treating a great many football injuries, more particularly cases of blood and fluid in the various synovial sacs, where rapid absorption was necessary in order to get the player back quickly into the team, I found hot air treatment could do in almost half the time what would be done by older methods of treatment. Thus in contused limbs and traumatic synovitis due to sprains and other causes, it gives excellent results.

Another type of injury which I have often had to treat, which is at times very troublesome, is the situation where an oedema of hand or foot which often follows a Colles's or Pott's fracture. If the limb is subjected to a fairly high temperature for a week or two the oedema as a rule disperses quickly, and the adhesions soften and can often be broken down without the aid of chloroform. Even if the latter be necessary, there is not the same inflammatory exudation after the "brisement force," more particularly if the hot air treatment be continued immediately after. One often meets in practice, too, obscure joint pains where nothing abnormal may be detected, but which are there when the patient comes down heavily on one foot. Perhaps "joint neuralgias" would do for want of a better term. These I have several times seen disappear after two or three hot air applications—and the cures have been permanent.

Fractures involving the elbow joint are often more difficult to treat successfully. There is always risk of stiffness and even ankylosis. By using the hot air treatment after waek or ten days, fixing the limb alternately in the fully flexed and extended positions, the latter by weighting the arm at night, allowing the weight to hang over the bed, I have had results which have been, I feel sure, better than I could have obtained with other methods.

It is principally in cases of commencing osteo and rheumatoid arthritis that I have had particularly good results with Bier's method. True, their exact cause is still a question of great dispute, but the fact remains that in many cases hot air has a powerful inuence in causing absorption of exudates. Many times I have been able to cure a case of rheumatism which has resisted the usual methods and seemed to be drifting rapidly into the chronic.

Criteria of Hospital Efficiency. S. S. Goldwater, M. D., New York, hospital consultant, in Bull. American Coll. Surg., XV:4:41, December, 1931.

The reasonable minimum standards proposed by the College are now thoroughly familiar to hospital trustees and require no defense or elucidation at this time. Briefly, the College asks that the staff be organized; that it be composed of competent men; that rules and regulations be formulated for its guidance, providing, among other things, for regular staff meetings and the critical end review of the end results of treatment; that adequate case records be kept; that diagnostic and therapeutic facilities (particularly those provided by the pathological laboratory, the x-ray department, and the department of phyiotherapy) be adequate and properly

organized; that for scientific and humanitarian purposes autopsies be obtained in a given proportion of fatal cases; and that the secret splitting of fees be abolished. The College is aware that the hospital has other professional needs and it therefore offers sound advice on the organization of the out-patient department, the nursing department, and the department of dietetics. These basic arrangements and practices are of fundamental importance and indisputably sound, but satisfactory administrative standards cannot be achieved without dealing with additional questions which arise in respect to both the internal administration of the hospital and its relations to the community.

Affections of the Peripheral Nerves. Read at a meeting of the New South Wales Branch of the British Medical Association on Aug. 27, 1931.

J. C. B. Allen, M. B., Ch. M. (Sydney), F. R. C. S., (England); in Med. J. Australia, II:18:546, Oct. 31, 1931.

General principles.—Certain general principles can be laid down for the treatment of paralytic conditions. First, it is esse tial to repair damage which has occurred in the nerve, to free it from the external influence or pressure and traction by adhesions. Secondly, there is the necessity of keeping the paralyzed muscles at rest and in a position of relaxation. This point must be stressed. Unless the affected muscle is put in its optimum position for recovery, degeneration from stretching will occur; and if the nerve supply is subsequently restored, the muscle is unable to carry out its allotted function and its usefulness has ceased to exist. Intimately associated with this question of relaxing paralyzed muscles is the necessity of placing the joints in their position of rest. Nothing will hasten the stiffening of a joint to such an extent as its fixation in a position of strain. Wherever possible this principle should be observed. It is sometimes, however, necessary to sacrifice the position of the joint to adhere to the dictates of the paralyzed muscle, for example, in a musculo-spiral palsy the wrist must be maintained in dorsiflexion, whereas, the wrist is relaxed in five degree palmar flexion.

Finally, we come to the question of physiotherapy. This branch of treatment is a further essential, and it should progress along definite lines. First, galvanism should be applied to the affected muscles in order to maintain artificially as far as possible their tone and vitality. When signs of recovery appear in the nerve, galvanism should be replaced by some type of faradic current which, it is needless to point out, stimulates the muscles through their nerve supply. Lastly, voluntary movements which not uncommonly appear before response occurs with the Bristow battery, should be encouraged from the outset. To repeat the old adage, "an ounce of voluntary movement is worth a ton of massage and electricity," and as soon as it is possible, active movements must be encouraged in every possible way by those in control of the patient. The interest of the patient must be stimulated so that he is prepared to give as much assistance as possible in the treatment of his own condition.

At the present time there is a tendency to decry mechanical devices in the treatment of these conditions. This I do not think is reasonable, as a well-devised machine which, however, depends for its work on the effort of the patient, adds greatly to the variety of the treatment and absence of montony. Take a bicycle for example. A man in middle life will get considerable satisfaction from being able to tell his friends of like age that he has ridden three miles, or whatever the distance may be, and he will increase his effort to break his previous record. These machines need not necessarily be accurate, and even though he may ride only a quarter of a mile, the exaggeration is justifiable.

Finally, with regard to treatment, we come to those cases in which recovery of the nerve has failed to take place. Various disabilities and deformities are the result, and in many cases considerable ingenuity is required to alleviate these conditions.

Temperature Distribution In Local Diathermy Treatments. By Allan Hemingway, Ph. D., Laboratory of Physiological Chemistry, University of Minnesota, and Cyrus O. Hansen, M. D., X-Ray Department, University Hospital, University of Minnesota, Minneapolis, in Radiology, XVII:6:1258, Dec. 1931.

By the majority of clinicians, the therapeutic value of diathermy is attributed to the production of heat within the tissues, resulting in a rise in temperature. Hence it is of importance to know the actual rise in temperature during a treatment in order to prevent damage to the tissue by too high a temperature, and yet to have a sufficient rise in temperature to be of therapeutic value.

Two types of diathermy electrodes are in general use. One is an electrode of pliable tin. The other consists of a felt pad soaked in electrolyte and applied to the skin, connection to the diathermy machine being made with copper gauze sewn to the outer surface of the pad. It has been reported that apparently greater heating is produced with a metallic electrode. In the present paper, we have investigated further the problem of the temperature distribution at the surface and in the tissues below these electrodes. The temperatures were measured by thermo-couples within number 22 hypodermic needles, soldered to the point of the needle, a method used by Bazett and McGlone. The thermocouple circuit is similar to the circuit of Clark.

RESULTS

For a short treatment of 20 minutes with diathermy and dosages to 12.0 ma. per sq. cm., the subcutaneous and intramuscular temperatures beneath a pliable tin electrode are from 1 to 5 degrees centigrade higher equilibrium values than the intramuscular temperatures below the pad electrode. The intramuscular temperature below the pad slowly approaches the equilibrium intramuscular temperature beneath the metallic electrode.

The surface heating is much less with the pad electrodes. This may be attributed to the cooling effect due to evaporation from the pad.

After an initial rise, lasting about 20 minutes, the subcutaneous and surface temperatures below the metallic electrode decrease to a final equilibrium value.

CONCLUSIONS

For a short treatment lasting about twenty minutes, a greater temperature can be obtained with a metallic electrode, since the rise in temperature is more rapid. This would explain the apparently greater heating effects observed by Bordier with the metallic electrodes, since his treatments were of short duration. For a treatment lasting an hour or longer, the deeper temperature beneath the saline pad increase to approach the deeper temperatures below the metallic electrodes. Thus, by using pad electrodes, the same deep heating effect is obtained with less superficial heating in a long treatment. In cases where a higher deep temperature is desired with a low superficial temperature, the pad electrode is to be recommended with a treatment of one hour or longer. For rapid superficial heating, the metallic electrode is used. In all experiments on dogs and human subjects, no superficial burns occurred with pad electrodes. Using high current values on dogs, contact

burns took place beneath the metallic electrode. No burning was ever observed with saline pad electrodes. Hence the saline pad is advantageous in that better contact is obtained. Care must be taken, however, to use a saline concentration of 10 per cent or greater, and to keep the electrode moist.

Epithelioma of the Skin. By Laurence Taussig, M. D., and Howard Morrow, M. D., San Francisco, from the Department of Dermatology of the University of California Medical School, in Radiology, XVII: 6:1281, Dec. 1931.

Artificial ultra-violet light has been shown to be a carcinogenic factor and this should make us hesitate to use such light in treating lesions of the skin which are apt to show cancerous changes.

In the treatment of epithelicma of the skin, certain principles are applicable to all types in whatever location they are found. No one method of therapy should be considered routine; the means should be varied to meet the circumstances. The treatment employed must be adequate to destroy completely the lesion to its furthest extent. Incomplete destruction is worse than useless in that it increases the resistance to further treatment by stimulating the growth to further extension and by producing fibrosis which tends to protect the cancer cells from destructive measures. The danger of removing a specimen for microscopical examination has been overstressed. The cosmetic effect is, of course, a secondary matter but should be given due consideration when possible.

Radiotherapy either in the form of X-ray or radium may be used alone or in combination with other forms of therapy. In recent years we have reserved radium therapy without other supplementary means for lesions, such as those of the eyelids, in which it is important to obtain the least possible destruction of uninvolved tissue. Where there is no contra-indication, we prefer to curet the lesion under novocaine anesthesia, cauterizing the base by electrodesiccation or with the actual cautery. Epithelioma of the ear is preferably a surgical problem and should be excised by the cautery knife, cutting current, or by sharp dissection. Radiotherapy is contra-indicated on account of the danger of producing a slow healing ulcerative reaction in the cartilage, when adequate dosage is given. Epithelioma of the hand is usually best removed surgically on account of the more rapid healing and because the ensuing scar is less marked than by other means. Epithelioma of the lip is best removed surgically in many instances, though an equal number of cures can be obtained by radium therapy alone or combined with curettage and desiccation. Radiotherapy is particularly indicated in those cases in which there is an extensive cheilitis and the lesion is apparently superficial.

The Photoactive Function of Cholesterol In Skin Cancer. Prof. A. H. Roffo, Director of the Institute of Experimental Medicine and Cancer Research, Buenos Aires, in the Lancet, II:XXII:1187, Nov. 28, 1931.

The most likely exciting cause of tumors of the face, particularly of the nose, is obviously the sun, to which this part of the skin is exposed. I have, therefore, undertaken investigations into the cholesterol content of the skin in various areas, basing my work on a theory I have long held:

That the soil in which a neoplasm appears is powerfully influenced by the lipoids. I have found a very considerable difference of cholesterol content between the skin of the face and that of the abdomen in the same person; in some cases there was five or seven times as much cholesterol in the face. Further investigations showed a marked difference between the covered and uncovered parts of the face itself; the nose contained over seventy-three per cent more than the forehead. These results seemed sufficient to indicate a heliotropism of cholesterol. I therefore irradiated the skin of the back of rats with sunlight and with ultraviolet rays keeping an excised portion of skin from the same level as a control. An increase of cholesterol was found in the irradiated skin.

It is known that the rays of the sun not only increase organic oxidation, but also accelerate cell metabolism generally, increasing cell osmosis. The effect would therefore be to increase the dynamism of the cells coincidently with the increase in the photo dynamic function. If, in accordance with the investigations of Hamburger, sunlight is regarded as a fixator of calcium in the organism, then according to my results, it may also be regarded as a fixator of cholesterol, which thus becomes not only a photo-dynamic substance, but also an organic accumulator of light. This may explain the great rarity of cutaneous cancer in negroes, in whom pigmentation prevents absorption of the luminous rays and phototoxic phenomena; this fact may be related to a homogenous distribution of cholesterol in their skins.

The Radiation Treatment of Some Skin Affections. By C. M. Henry, M. D., C. M., F. A. C. S., Regina, in Canad. M. A. J., XXV:6:702, Dec. 1931.

Acne

Acne in its various forms is one of the most common infections. When it does not respond to medical, dietetic, or serum treatment it will often respond to radiation therapy. Whether the infection is local or general, good results are obtained by a combination of ultra-violet and x-ray treatment. The patient is given one-sixth of an erythema dose of x-rays every five to seven days, for four or five exposures; then exposure to the mercury quartz lamp at 20-inch distance (F. S. D.) at 70 m. a., to effect a skin erythema, every second or third day, and continued for a period of two to three weeks. The patient is instructed to steam the affected areas, and to scrub thoroughly with green soap and hot, soft water, using a brush or rough cloth. This is to be followed by careful drying and then sponging with a good quality of gasoline.

Impetigo

If the infection has been present for several days quicker results are secured by the combined use of x-rays and quartz lamp treatment.

Eczema

It is not an external disease or an internal disease. It is both always, and at the same time, and often responds to radiation therapy when other remedies fail. The patient is either cured or much improved by either x-ray or quartz lamp, or a combination of both. However, careful judgment must be exercised in treating the acute forms as compared with the chronic conditions.

Psoriasis

However, it will often respond to the water-cooled mercury quartz lamp applied very closely or in contact, while if the disease is widespread over the body, x-rays and the air-cooled quartz lamp will produce good results, but a tendency to relapse after months or years is frequent.

Tinea Capitis, Tinea Tonsurans and Sycosis Barbae

These respond to one x-ray treatment, but the dose must be carefully measured to cause epilation only, and not to destroy the hair follicle.

WARTS, CORNS AND MOLES

These disappear when rather heavy unfiltered doses of x-ray are administered.

ERYSIPELAS

There is no medical treatment that will terminate erysipelas as quickly and effectively as one exposure to x-ray treatment.

ACTINOMYCOSIS AND BLASTOMYCOSIS

This infection may be benefited and often cured by repeated treatments of x-ray therapy of moderate dosage.

NAEVI

As it is difficult to keep a young child quiet long enough to administer x-ray treatment, it is advisable to apply a radium plaque or pack for the required time. When radium is used it is necessary to repeat the treatment at two or three monthly intervals until the desired result is obtained. With x-ray, when it can be employed, one treatment is often sufficient. There are certain kinds of naevi in which surgical diathermy is preferable. However, for the face or exposed surfaces, x-ray or radium is the method to be preferred in all forms of raised naevi or haemangioma. The port-wine form of naevus is not usually amenable to any form of treatment.

KELOID

This condition is favorably influenced by either radium or x-rays.

ALOPECIA AREATA

Narduci reports his results from the use of ultra-violet rays in the treatment of 25 cases. In 17 a complete cure was effected after from 16 to 35 exposures. The technique employed is to use a water-cooled mercury quartz lamp, applied at a distance of one-half inch from the area, administering a full erythema dose twice, at three-day intervals. Repeat this every two weeks until three or four series are given. Within six weeks the hair will reappear. Occasionally, a small area will recur, when the series is repeated.

Persistent Hereditary Edema of the Legs—Milroy's Disease. James Harvey Jannett, M. D., Kansas City, Mo., in J. Missouri M. A., 28:12:601, Dec. 1931.

Treatment with drugs, gland extracts, massage, and electricity is of no value. Binding relieves the weight and clumsiness of the legs but the relief is only temporary and is usually given up by the patient. Surgery seems to be the best treatment. Ligation of the femoral thectomy has been suggested but to my knowledge never tried. The Kondoleon operation especially the modification of Sistrunk in which long strips about two inches wide of skin and subcutaneous tissue and fascia are taken out of the inner and outer sides of the legs from trochanters to malleoli down to the muscles and the edges reapproximated, has given beneficial results in several cases of similar abnormality. This theoretically connects the superficial and the deep lymphatics and permits improved drainage. We are contemplating this operation for at least one of our patients.

Treatment for Atrophic Rhinitis. Joseph S. Stovin, M. D., New York, Instructor in Rhinolaryngology, New York Policlinic Medical School and Hospital; Adjunct Otolaryngologist, Hospital for Joint Diseases; in Arch. Otolaryng., 14:5:618, November, 1931.

In the treatment of patients with atrophis rhinitis, attention to the general health and hygiene is important, and all local contributory causes, such as sinus disease, should be eradicated as far as possible. It is important that the proper amount of moisture in the air should be maintained.

As for local treatment, I have found that stimulation with the galvanic current gives the most satisfactory results in restoring nasal mucosa to a healthy state and in keeping it in good condition. Moreover, I have found that this form of treatment improves the sense of smell, a fact that is of great importance from the patient's point of view. My method of procedure is as follows:

First, the nose is cleansed by the "wet-suction" method. Warm physiological solution of sodium chlorid is run into one nostril, the head being lowered, while the patient says K-K-K, and the return flow is sucked from the other nostril into a suction bottle. The nasal tips are alternated several times during the procedure, so that the nose will be thoroughly cleansed of all mucous, dried scales and crusts. Next each nostril is packed with successive layers of absorbent cotton moistened with physiologic solution of sodium chlorid, beginning at the floor of the nose and building up the nasal roof. Care should be taken to line the mucous completely, especially that covering the olfactory area. The cotton strips should be long enough to extend out of the nose for at least half an inch (1.27 cm.).

The electric apparatus required is the simple galvanic wall plate with positive and negative pole. Either one may be used as the active electrode, and it is my practice to alternate them, making the positive pole the active electrode for one treatment and the negative pole the active one for the succeeding treatment. The active pole is attached to the protruding cone and the negative pole is held in the patient's hand or attached to his arm. The current is now turned on, and the rheostat moved up slowly. When the patient complains of the salt taste in his mouth, sufficient current has been applied. The milliampere reading is usually between 5 and 10 and that current is applied for fifteen minutes. At the end of this time the rheostat is moved back slowly, the current turned off and the packs removed. An oil such as Balsam of Peru in castor oil, or Mandl's solution is now applied to the membrane. These treatments are given three times a week, and improvement is usually noted after a few treatments.

I have found the galvanic current to be the method of choice in the treatment for simple atrophic rhinitis. I also use galvanism in the treatment for ozena, but with far less satisfactory results.

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